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ENVIRONMENTAL BASELINE PROGRAM

FINAL REPORT

(November 1974 Through October 1976)

VOLUME IV

ECOLOGY

APPENDICES A AND B

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APPENDIX A

APPENDIX A METHODOLOGY, EXPERIMENTAL DESIGN, AND QUALITY ASSURANCE

A.1 Microenvironmental Methods

A.1.1 Recording Stations

The basic data collection system contained in the magnetic tape station consists of a Ball Brothers Model 700 F data logger with a digital cassette recorder. The remaining stations contain two Rustrak strip chart recorders mounted in NEMA type field cases. The following basic modules comprise each station:

1) Power Supply (AC at 2 stations and 12 volt battery power pack at 2 stations)
2) Data Processor
3) Multiplexer
4) Timer
5) Recorder Interface

This basic system can be used to record up to 20 analog parameters with time annotation of day, hour, and minute information with the digital cassette recorder. The Rustrak recorders are multiplexed and capable of logging up to 10 parameters including reference checks, and can be read to an accuracy of 15 minutes. Presently the digital cassette recorder (DCR) records data every 30 minutes and the Rustrak records data every 20 minutes.

In addition to the basic modules, the following sensor interface modules are used:

1) Wind Speed/Direction
2) Accumulator (for precipitation, free air temperature sensors, and relative humidity -- DCR station only).
3) Net Radiation (DCR station only).

The Wind Speed/Direction modules are used to integrate the wind information over a 10 minute period. The Wind Speed signals are digitally integrated such that the most current 10 minute wind run is always available for recording. The integration period is accurately determined by a quartz crystal time base. The frequency output of the wind speed tachometer is used rather than the the d.c. level to further improve the overall long term accuracy. Wind direction is integrated over a 10 minute period; however, an analog averaging filter is used rather than a digital technique.

The Accumulator Module has a digital accumulator which counts the number of tips made by the tipping bucket. It has a range of 0.00 to 9.99 inches of rain. It automatically starts over from 0.00 when this range is exceeded. It can be manually reset to zero by a front panel switch. This module also generates precise voltages for the thermistor free air temperature sensors.

All sensor interface circuits which must remain on between recording samples (such as the integrators and accumulators) employ very low power CMOS integrated circuits so that extended battery operation is possible.

The digital recorder is a Memodyne Model 201 with extended temperature range cassettes. This recorder system operates over the temperature range of -20°C to +60°C. All other portions of the data system are specified for operations over the range of -40°C to +60°C. The recorder capacity, based on the number of sensors specified plus time annotation, is approximately 1300 records. Thus, if a record is taken once each hour the cassette will hold up to 54 days of information. The recorder is mounted in a separate, dust-tight case.

Wind speed and direction were measured using an R. M. Young "Gill" Propeller Vane, supplied with an injection moulded, ABS plastic, three-bladed propeller and aluminum fin. Threshold sensitivity for this unit is less than 0.1 KPH. Survival velocity exceeds 160 KPH. The wind azimuth range is 540° to reduce the occurrence of integration across discontinuities. The frequency output rather than the absolute d.c. voltage output from the wind speed generator is used. The pulse signal which is exactly equivalent to propeller rotation is digitally integrated by the WS/WD Module in the Data System. All sensor power and translator circuits are contained in the Data System so that only the basic sensor is required. Each wind sensor (3 meter and 1 meter) was mounted on a 2 meter arm (Appendix IV-A, Figure A-1-1).

Free air temperature was measured using YSI Thermilinear Model 705 thermistor networks. The sensor accuracy is ±0.15°C over the range of -30°C to +50°C. Each of the three sensors were mounted inside an R. M. Young Model 43103 Radiation Shield.

Relative humidity was measured by a Vaisala Humicap probe. This probe was strapped to the support mast of the one meter ambient temperature shield. Excitation voltage and interface circuits are located on the Accumulator Module in the Data System.

Precipitation was measured using a heated tipping bucket gauge, Weather Measure Model P511-E. This gauge quantizes the precipitation into 0.25 mm increments. It is heated by the a.c. power source for snow measurement. Propane heated gauges were used in the d.c. powered stations. The output of the tipping bucket switch was directly connected to the digital accumulator in the Accumulator Module in the Data System.

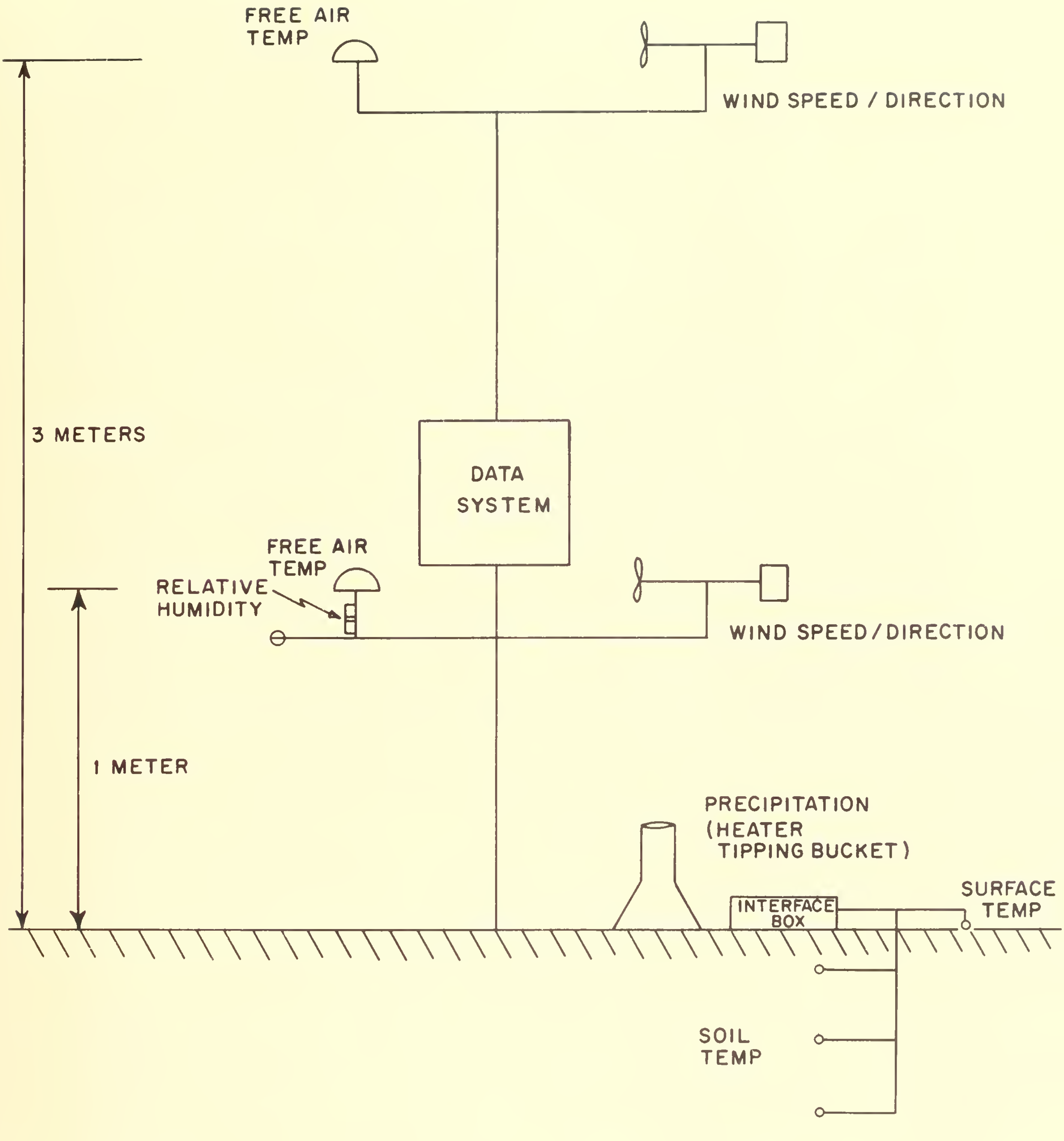

FIGURE A-1-1 BASIC MICROENVIRONMENTAL STATION

Soil temperature was measured using YSI Model 701 Thermilinear probes. The sensor accuracy is ±0.15°C over the range of -30° to +50°C. Each of the five probes were supplied with a three meter cable. One probe was placed in surface litter. A weatherproof interface box was equipped with a 15 meter cable which will be connected to the Data System. In this way it was possible to position the interface box in an area of undisturbed soil.

Net radiation was measured with a "Fritschen Type" sensor, Weather Measure Model R422. The output of this device was digitally integrated during the entire period between recording samples (normally one-half hour). All sensor interface circuits will be contained in a Radiation Interface Module in the Data System.

A.1.2 Spot Check Stations

The 17 spot check stations were equipped with the following instrumentation all mounted at ground level:

1) Taylor min-max thermometers.
2) Tru-check rain gauges
3) Piche evaporimeters placed in an ABS plastic shield

Snow measurements were made at each site using a Mount Rose Snow Sampler.

Relative humidity measurements were made using an Aitken pistol-type thermister psychrometer.

Soil moisture measurements were made using a Chicago nuclear neutron probe (Figure A-1-2).

A.1.3 Statistical Calculations

A.1.3.1 F ratio

$$F_c = \frac{\text{group mean squares}}{\text{error mean squares}}$$

F^* = Critical value of F taken from an F distribution table where

$F^* = F\ 0.05\ (1)$, error df, group df.

If $F_c \geq F^*$ the null hypothesis is rejected

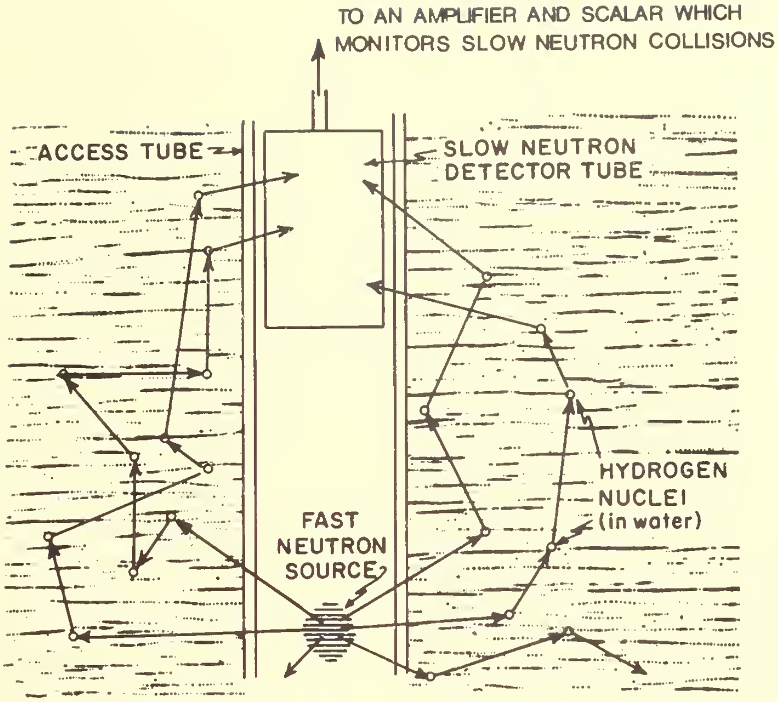
TO AN AMPLIFIER AND SCALAR WHICH MONITORS SLOW NEUTRON COLLISIONS
ACCESS TUBE
SLOW NEUTRON DETECTOR TUBE
HYDROGEN NUCLEI (in water)
FAST NEUTRON SOURCE

FIGURE A-1-2 NEUTRON PROBE OPERATION

A.1.3.2 q value

$$qc = \frac{\text{the difference between the 2 means tested}}{\left(\frac{\text{error mean square}}{n}\right)^{1/2}}$$

q* = Critical value of 9 taken from
a q distribution table where

q* = q 0.05, 195, p (p = the number of means
in the range being tested)

If qc $\geq$ q* the null hypothesis is rejected

A.2 Soil Study Methods

A.2.1 Soil Analysis, Laboratory Methods

A.2.1.1 General Parameters

pH	hydrogen ion electrode (1)*
E.C.	specific conductance, conductivity bridge (1)
C.E.C.	cation exchange capacity, sum of cations method (3)
E.S.P.	exchangeable sodium percentage calculated (4)
S.A.R.	sodium absorption ratio calculated (4)

A.2.1.2 Chemical Analysis (plant available fraction of soil elements)

Soils are air dried and pulverized to about 1/8 inch minus. A continuously agitated slurry of 100 gm soil and 200 gm water is prepared. Subsequent subsamples are removed volumetrically as required. This is known as the IOWA STATE METHOD.

PERCENT ORGANIC: acid chromate digestion, colorimetric quantitation (1)

PERCENT LIME: sulfuric acid digestion. Sodium hydroxide back titration.

ORGANIC MATTER NITROGEN: calculated release (1)

Ca, Mg, K, Na: ammonium acetate extraction, AAS quantitation (1) and (3)

PHOSPHORUS: sodium bicarbonate extraction, ascorbic acid reduction/heteropoly blue, colorimetric quantitation (1)

SULFATE: hot water extraction, barium chloride turbidimetric (3)

NITRATE: Specific Ion Electrode

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* Refers to literature citation

AMMONIA: Micro distillation, Nesslerization (3)

BORON: hot water extraction, circumin/colorimetric quantitation (3)

FLUORIDE: hot water extraction, perchloric acid distillation, SPADNS quantitation (3) and APHA handbook

SELENIUM: hot water extraction, DAN/fluorimetry quantitation. Turner inst. bulletin

MOLYBDENUM: ammonia oxalate extraction, APDC/MIBK solvent extraction, AAS quantitation (3) and Perkin Elmer Inst. bulletin

ARSENIC: hot water extraction - arsine generation, molybdenum blue/colorimetric quantitation (3)

MERCURY: nitric sulfuric acid extraction, flameless AAS quantitation (EPA bulletins and other)

Saturated Soil Extract

Sample preparation and testing for these parameters are performed according to Chapter 6 USDA Handbook 60 except that cations are quantitated by AAS.

Physical Parameters

Procedures for soil particle size classification, bulk density, permeability, water retention under tension, and porosity can be found in American Society of Agronomy, Part I. These procedures or similar adaptations were used for these tests.

References

(1) Standard methods of soils testing laboratory, Colorado State University. Methods leaflets are available.

(2) Part I, Agronomy No. 9, Methods of Soil Analysis, American Society of Agronomy.

(3) Part 2, Agronomy No. 9, Methods of Soil Analysis, American Society of Agronomy.

(4) Diagnosis and Improvement of Saline and Alkali Soils, USDA Agriculture Handbook 60.

A.2.2 Statistical Analysis Methods

A.2.2.1 Analysis of Variance

Analysis of variance in a factorial design of an experiment is used in assessing the effects of changing controlled levels of two or more variables. Analysis of variance is especially useful if the number of variables is between 3 and 10, and when the controlled levels for each variable are between 2 and 6.

The parameters used in this study are not controlled, but are identified and measured as a result of selective sampling. The parameters are ammenable to grouping so that the data has been ordered into matrices similar to those used in factorial design. Analysis of variance applied to the matrices can assess the contribution of each parameter to the sum of square of the deviations from the mean. Interactions between parameters identified in this analysis must be interpreted carefully since this is not a controlled experimental design.

Table A-2-1 shows how shrub importance values have been regrouped by soil type and plant community to produce a matrix of four classification parameters. The parameters included are eight species of shrubs, three sample sites, three vegetation and soil types, and two sets of data. The two sets of data are, at best, only similar.

A.2.2.2 Regression and Correlation Analysis

Correlation considers the joint variation of two measurements, neither of which is controlled by the investigator. Regression considers the frequency distributions of one variable when another is held constant at each of several levels. Treating one of several variables as a dependent permits the calculation of a mathematical relationship between the dependent variable and the several independent variables. A statistical test of independence based on the coefficients of regression and standard errors of the estimates can be used to identify significant relationships between the individual parameters.

Multiple linear regression analysis has been applied to the data in this study in order to assess the significance of relationships and correlations between various shrub and herbaceous species. Relationships between species as well as the relationship between vegetation and soil constituents has been treated using multiple regression procedures.

In these analyses, simple and partial coefficients of correlation have been developed between pairs of data observations. Simple correlation shows the relationship between two variables and reflects the effects of the other variables. Partial correlation demonstrates the correlation between two variables, while discounting or holding constant the effects of the other variables. Multiple correlations have been developed between a dependent variable and several other

Table A-2-1

CLASSIFICATION OF VARIABLES FOR ANALYSIS OF VARIANCE

SHRUB IMPORTANCE VALUES

SOILS VERSUS SHRUB IMPORTANCE VALUES

SAMPLE	SOIL	TYPE	OPPO A1	ARTR A2	SYOR A3	JUOS A4	PUTR A5	PIED A6	AMSP A7	CHNA A8			
4-4	(41)404F	BLSB	12.6	245.4	0.0	0.0	2.7	0.0	0.0	7.5	B1	C1	D1
A16	(41)16	BLSB	16.4	225.6	8.2	0.0	0.0	0.0	0.0	49.8	B2		
A19	(41)19	BLSB	7.6	261.8	0.0	0.0	0.0	0.0	0.0	30.0	B3		
5-5	(63)505F	PJWD	0.0	86.9	0.0	14.2	24.3	65.6	65.6	5.6	B1	C2	
A9	(63)9	PJWD	19.4	49.8	5.8	14.8	145.6	41.8	0.0	0.0	B2		
A13	(63)13	PJWD	0.0	14.9	113.9	4.1	23.5	11.0	34.2	4.9	B3		
2-2	(66)202F	CPJR	11.9	34.3	10.2	34.4	38.6	50.0	14.9	64.8	B1	C3	
A7	(66)7	CPJR	17.5	78.5	104.2	23.3	11.0	12.6	18.5	5.9	B2		
A10	(66)10	CPJR	6.2	124.5	9.9	16.6	86.5	28.9	9.9	9.0	B3		
3-3	(71C)303F	UPSB	23.8	234.2	0.0	2.8	0.0	16.0	16.8	5.0	B1	C1	D2
A15	(71C)15	UPSB	2.6	133.8	41.6	0.0	1.2	7.7	49.2	58.8	B2		
A11	(70)11	UPSB	24.9	235.9	2.2	7.1	0.0	21.5	2.6	0.0	B3		
1-1	(63)101F	CPJR	6.8	141.7	10.1	13.3	32.3	19.5	11.3	26.5	B1	C2	
A20	(63)20	BUGR	4.7	31.7	0.0	0.0	0.0	0.0	0.0	3.4	B2		
A21	(63)21	DGFF	0.0	0.0	106.1	16.0	0.0	11.8	0.0	0.0	B3		
6-6	(66)606F	PJWD	45.8	171.0	3.0	16.7	2.5	23.5	25.4	26.7	B1	C3	
A14	(66)14	CPJR	1.6	3.2	100.9	29.2	17.9	38.3	31.3	1.6	B2		
A12	(66)12	PJWD	28.3	113.1	14.2	7.5	5.7	49.6	35.0	0.0	B3		

independent variables. The multiple regression equation is a mathematical expression stating the statistical dependence of one variable on several independent variables as in the following equation:

(Eq. No. 2-1)

$$\bar{y}_x = b_o + b_1 x_1 + b_3 x_3 + \ldots\ldots + b_n x_n$$

where: $\bar{y}_x$ = the estimate of y based on observations of a set of x variables which may influence y

b_o = the intercept or value of y when values of all x are zero

b_1, b_2 = are the regression coefficients for all corresponding x variables

x_1, x_2 = the independent variables observed

n = the number of independent variables observed

The regression equation is determined by multiple linear regression analysis and evaluating many sets of observations of a dependent variable and corresponding independent variables. The analysis determines the intercept (b_o) and the regression coefficients (b_i). The equation is used to calculate estimated values of the dependent variable ($\bar{y}_x$). Residual values exist as the differences between the estimated values ($\bar{y}_x$) and the observed value of the dependent variable. Multiple linear regression analysis determines the set of regression coefficients (b_i and b_o) that minimizes the sum of the residuals.

Correlation and regression analyses were performed using an IBM 370/168 computer and a multiple linear regression program. Analyses performed correlated shrub species with shrub species, herb species with herb species, soil characteristics with soil characteristics, and each of the vegetation species with each soil characteristic. A typical computer output is shown in Appendix B, Table B-2-9.

In this analysis juniper (Juniperus osteosperma JUOS) (dependent variable) is correlated with a set of soil characteristics (independent variable). The simple correlation coefficients, regression coefficients, and computed T-values are the principal statistics discussed in the following analysis.

Shrub correlations are shown in Appendix IV-B, Table B-2-6. Values shown are segregated to indicate three levels of statistical significance: confidence intervals at 95, 90, and 75 percent (the smaller the percent, the larger the interval). These segregations were employed to introduce the opportunity for assessing correlations on a more complete biological level rather than on the basis of statistics alone.

Herb correlations are shown in Table B-2-7, soil correlations are in Table B-2-8 with the same confidence intervals as discussed for shrubs above.

The square of the coefficient of correlation (R) is called the coefficient of determination (R^2). This is the proportion of the total sum of squares that is attributed to the correlation between the pairs of parameters. The T-value shown here is the regression coefficient divided by its standard error. A significant T-value (T 2.8) indicates in multiple linear regression analysis, that the independent variable is making a significant contribution in the regression equation for the dependent variable.

In these analyses shrubs and herb species were correlated with soil nutrient values by means of linear regression and second degree regression analyses.

A.2.3 Soil Microbiology Studies

Replicate samples were obtained for analysis of total bacteria colonies/gram, actinomycetes colonies/gram, percent of total number of bacteria showing denitrification, presence of nitrifiers, and fungi colonies/gram. Three replicates were collected from soil beneath mountain mahogany (chosen as a representative shrub) and from open ground with no shrub overstory. On Grid 2 (pinyon-juniper) open ground was predominantly bare with a pinyon-juniper overstory and on Grid 2 (chained pinyon-juniper) open ground was predominantly covered with an herb layer and no pinyon-juniper overstory. Each soil sample was homogenized at a 1:100 dilution in sterile distilled water. All analyses were conducted using this dilution.

A.2.3.1 Estimation of Fungi Abundance

All fungal counts were conducted on potato dextrose agar containing approximately 30 mg/l each of penicillin and streptomycin to inhibit bacterial growth. Each plate was inoculated with 0.1 ml of the soil solution. Each sample was plated in triplicate and incubated at room temperature in the dark for five to seven days, at which time fungal counts were made. Counts reported were average values.

A.2.3.2 Estimation of Actinomycete Abundance

The actinomycete counts were determined by growth on actinomycete isolation agar. The plates were inoculated with 0.1 ml of a 1:10 dilution of the soil solution (equivalent to 0.01 ml). Again, samples were plated in triplicate and incubated at room temperature in the dark for nine days. Counts reported were average values.

A.2.3.3 Estimation of Total Bacterial Abundance

The medium used for this count was trypticase soy agar (TSA). Each plate was inoculated with 0.1 ml of a 1:100 dilution of the soil solution (equivalent to 0.001 ml). Each sample was plated in triplicate and incubated at room temperature in the dark for five days. Counts reported were average values.

A.2.3.4 Determination of Denitrifier Presence

The percentage of denitrifiers present was determined by the inoculation of 40 colonies (selected at random) from the trypticase soy agar plates into tubes of trypticase soy broth containing 0.5 percent KNO_3 (one colony per tube to TSB). The TSB was inoculated at room temperature for five days. At this time, each tube of TSB broth was tested by the following method (Bailey and Scott 1970).

Solution A = 8 gm sulfanilic acid in 1 liter 5 N acetic acid
Solution B = 5 gm alphanaphthylamine in 1 liter 5 N acetic acid

To each sample 0.5 ml of solution A was added. After two minutes, 0.5 ml of solution B was added. The development of a red color indicated the presence of nitrite. To any negative tubes, zinc was added. The development of a red color indicated nitrate was still present. If no color development occurred, it was assumed that reduction to ammonia or nitrogen had occurred, and that denitrification had taken place. The number of tubes showing denitrification was then used to determine what percentage of total bacteria were denitrifiers.

A.2.3.5 Determination of Nitrifier Presence

Because it is difficult to isolate nitrifiers on solid media, only the presence or absence of nitrifiers was determined utilizing media described in Clark and Shmidt (1967). This medium tests for the oxidation of ammonium to either nitrite or nitrate. Eight tubes of 10 ml of media per sample were inoculated with 5 ml of the soil solution. One tube per week for eight weeks was tested for the presence of nitrite and nitrate according to the method used for denitrifying bacteria (solutions A and B). An uninoculated medium blank was also tested each week for comparison. Detection of nitrite or nitrate indicated presence of nitrifiers.

A second medium used for nitrifiers is described by Watson and Mandel (1971). It was necessary to use this second medium because some nitrifying bacteria oxidize nitrite to nitrate. Again, eight tubes of 10 ml of media were inoculated per sample with 5 ml of the soil solution and one tube tested per week for eight weeks for the presence of nitrate. The same test for nitrite as before was used (solutions A and B plus zinc) but any nitrite which may have remained from the original medium had to be discharged first by the following method (Feigl 1958): Sodium azide and 0.3 ml glacial acetic acid was added to each tube. After allowing a few mintues for reaction, the tubes were heated to boiling in a hot water bath and boiled for ten minutes. After cooling at room temperature, they were tested for the presence of nitrate. Again, an uninoculated medium blank was run with each test.

A.3 Vegetation Methods

Refer also to the section on experimental design to see how these methods were implemented in the Tract vegetation studies.

A.3.1 Flora

The preparation of the list of species was accomplished by recording all species observed during any of the sampling activities on the Tract. The sampling program necessitated that each of the vegetation types be examined in some detail such that most of the available habitats were visited and component species were recorded. Other areas, such as sheltered box canyons and rock escarpments which were not sampled, were visited specifically to note the species growing there, since these sites were the most likely to harbor any threatened or endangered vascular species.

An attempt was made to collect a voucher specimen for all observed species; however, certain of the species were not collected.

Laboratory analysis of the flora included the preparation of an annotated list of the species which included life forms, geographical distribution, common name, plant family, statement of abundance, and plant community affinity. Collected specimens were mounted and eventually sent to the laboratory on the Tract where the reference collection is housed.

A.3.1.1 Phytosociological Studies

A.3.1.1.1 Vegetation Mapping

The vegetation map was prepared using a modification of Küchler's (1967) comprehensive method which entails the combined use of air photo interpretation and field checking.

Prior to field work on the map, all available aerial photographs of the site were examined. Color, color infrared, and black and white photos at an approximate scale of 1:6000 were used to prepare the final map at a scale of 1:12,000. Boundary lines were drawn between vegetation types, and the lines were visually transferred to a preliminary base map. The classification of the vegetation into types was based on prior field work and a general familiarity with the area. Those types which were readily recognizable were identified as such on the preliminary base map. Those areas for which the vegetation type were not recognizable from the photographs were checked in the field. After the entire area was field checked, the preliminary base map was revised, and a final copy was prepared.

A.3.1.1.2 Broadly Based Vegetation Sampling Program

The sampling of vegetation stands as part of this program was conducted using the point quarter method (Cottam and Curtis 1956) to estimate tree densities, frequencies and basal area; Lindsey's (1955) line strip method to estimate shrub cover, density and frequency; and a quadrat method for estimating herb frequency and ground layer parameters.

The selection of stands was made on the basis of homogeneity (all stands were located within a single vegetation type), size of the area (the area had to be large enough to accomodate the sample), and disturbance (heavily disturbed sites were avoided where possible). The number of stands which were sampled in each of the types was based on the areal extent of the communities. More stands were sampled in the widespread communities, and in the communities of lesser extent, usually a single stand was sampled. Stands were selected on the basis of their representativeness of a type, rather than being randomly selected.

Within each stand herb quadrats and line strip transects were located in a grid pattern. The corner of the grid was randomly located. All stands were sampled with 1.0m^2 quadrats. The lengths and widths of the belt transects were altered to fit the vegetation type and sampling location. In woodland stands, trees were sampled using 40 quarter method points. Points were located at equal intervals along paced transects.

A.3.1.2 Intensive Study Plot Studies

The sampling at the intensive study sites was accomplished in the same manner as in the broadly based sampling program for shrubs and herbs, except that herb quadrats and shrub transects were permanently located. Trees were sampled by making actual counts within the sampling grid outlined by the permanent quadrat positions.

Each of the trees within the plot was marked with an aluminum tag. The height of tag attachment marked the height at which the tree was measured.

A.3.1.3 Productivity Studies

A.3.1.3.1 Herb Production Studies

Net above ground herb production has been estimated using a harvest method (Milner and Hughes 1968). The basic approach has been to use small clip quadrats randomly located at the intensive study sites.

All clipped herb samples were returned to the Woodward Clyde Laboratories in San Diego. Samples were dried at 50° C and were then weighed to the nearest 0.1 milligram.

A.3.1.3.2 Shrub Production Studies

Shrub production has also been studied using a harvest method (Newbould 1967). Estimates have been made by clipping entire stems at ground level and then extrapolating to weight of entire plants based on the mean number of stems per plant. Standing Crop values were then converted to areal estimates based on density estimates. Production was estimated by comparing standing crop values in April and September. Production estimates from this study include growth of new shoots, leaves, and radial increases in woody tissue.

During the first year of study, shrub samples were collected from the fenced and open plots except for rabbitbrush, saplings of pinyon pine, and saplings of juniper which were collected on the ridge east of Sorghum Gulch and the ridge east of Cottonwood Gulch. Samples for winterfat were collected in the area immediately down-valley from Plot 4-F. During the second year no shrub samples were collected from the fenced plots. Samples for bitterbrush, mountain mahogany, serviceberry, and big sagebrush were collected from the areas around Plots 1, 2, 3, and 4, but were not collected from open plot study areas. Collections for the other species were made in the same areas as in the first year. All clipped shrub samples were returned to San Diego, dried at 50° C and were weighed to the nearest 0.1 gram.

In order to provide an estimate of new shoot production (i.e., that portion of a shrub available for deer consumption) a second study was also conducted. New shoots (current year's growth) were clipped from a sample of shrubs. The number of new shoots per stem, and the number of stems per plant were counted so that extrapolations to weight per area estimates could be made. Shoots were clipped in September. In the lab, leaves were separated from stems and weighed separately. Samples were oven dried at 105° C for 24 hours, and then weighed to the nearest milligram on a top-loading Mettler balance.

A.3.1.4 Decomposition and Litter Fall Studies

Decomposition was studied using leaf samples of known weight enclosed in nylon mesh bags. Bags were placed in the field, retrieved after a period of time, and were reweighted. Percent weight loss was then used as a measure of decomposition. Samples were placed on the surface and at a depth of 10 cm.

Following retrieval from the field the individual packets were cleaned by mechanical removal of as much mineral soil as possible without damaging the contents of the packet. All packets were then dried at 50° C for 48 hours and weighed to the nearest milligram. A sub-sample of packets was then obtained and each packet was washed in a 354 micron sieve. Mineral soil was removed and all organic material was left with the packet. These packets were then re-dried and re-weighed in order to estimate the amount of soil remaining after the mechanical cleaning. A correction factor for the amount of soil remaining was derived for each of the test materials at each of the sites. All sample weights were then corrected using these factors. Percent decompostion was calculated by dividing the measured weight loss by the original weight of the test material.

Litter fall in the woodlands and bottomland sagebrush community was studied using randomly located $0.25m^2$ litter traps (Newbould 1967). Collected samples were returned to the lab, oven dried at 105° C for 24 hours and weighed to the nearest milligram.

A.3.1.5 Herb Phenology

Herb phenology was studied by repeated sampling of permanently marked quadrats. The number of individuals in each quadrat was counted and separated into eight growth stages (phenophases): Vegetative stage, production of culms, flower and inflorescence buds, blossoming, unripe seeds and fruits, ripe seeds and dispersal, yellowing of leaves, death or partial dieback.

A.3.1.6 Shrub Stem Growth Studies

The study of shrub stem growth has been conducted by repeated measurement of marked twigs on the major shrub species (Harvey 1972). Individual plants located inside and outside of the fences at the intensive study plots were studied to evaluate the effect of deer browsing on stem development.

A.3.2 Quality Assurance

Quality assurance in vegetation studies focuses primarily on the experience, carefulness, and consciousness of the people involved in data collection. The field equipment which has been used for data collection on Tract C-b consists primarily of non-sophisticated tools which require very little calibration. Of greater importance is the experience of the field personnel collecting the data. All technicians were trained under the guidance of the principal investigator in order to maximize continuity of data collection. In the laboratory, weighings were made with quality balances (Mettler) in order to obtain the most accurate values possible.

Data summarization was conducted by a person familiar with the area who also was trained to recognize aberrant values within data sets. Where possible, data sets were doubly summarized and cross-checked in order to insure accuracy.

Overall data quality was continually checked as analyses and report preparation progressed. Any data sets or values which seemed inconsistent with other obtained values or biological processes on the Tract were rechecked for accuracy relative to the manner in which the data sets were collected and summarized.

A.4 Animals

A.4.1 Big Game

A.4.1.1 Methods

A.4.1.1.1 Pellet-Group Studies

Sixteen transects were used during the first year of baseline study for measurements of deer pellet-groups. This number was increased to seventeen the second year by adding an additional line in the pinyon-juniper/bottomland sagebrush ecotone to satisfy requirements of sampling adequacy following the recommendations of Overton and Davis (1969). The designation, "pinyon-juniper/ bottomland sagebrush ecotone," replaces "valley sagebrush" which was used for reporting the first year's results (Annual Summary, Table V-1). The newer designation is preferred since these lines cut across habitat gradients with few plots being within the valley (bottomland) sagebrush habitat type. Total number of deer pellet plots for each habitat type sampled is located in Table 3-4-1, Section 3.4.1.5.2.

Definitions of the remaining habitat types also became more firmly established the second year, resulting in the field team's assigning certain pellet-group plots to different habitat types the second year. Inconsistencies which exist between the number of pellet-group plots reported for each habitat type in 1975 (Annual Summary Table V-1) and the number reported in the Final Report (Table 3-4-1) are therefore due to the reclassification of habitat type for certain pellet-group plots.

A.4.1.1.2 Production and Utilization of Key Browse Plants

Ocular and tagging methods used to estimate shrub production and utilization were modified the second year of baseline study. Estimates of vegetation cover by the ocular method were not used the second year, since these estimates were available from vegetation studies. Shrub tagging methods used for estimating new shoot growth consumed by deer were modified to provide adequate sample sizes for bitterbrush and mountain mahogany. Data on sagebrush were not used because of uncertainties regarding the location of new shoot growth.

A.4.1.2 Quality Assurance

Data quality assurance, as it concerns big game and medium-sized mammal studies, centered on insuring that methods were repeatable and that the recording and analyzation of data were accurately performed. This was accomplished by permanently marking field study plots and by recording these locations on a map. Field data were duplicated to insure against loss. Statistical tests were conducted on a programmable calculator and results verified using tested programs. Data for presentation were checked against original copy to insure against typographical error.

A.4.2 Small Mammals

A.4.2.1 Methodology

A.4.2.1.1 Population Estimation of Small Mammals on Tract C-b

On quantitative Grids 1 and 2, 4" x 4" x 14" Smith live traps were placed at 15 meter intervals on an inner 10 x 10 grid resulting in a total of 100 traps. A perimeter line without traps and a dense line were established at 15 meters and 30 meters, respectively, outside the inner grid. Traps on the dense line, designated X line, were also spaced at 15 meter intervals for a total of 52 traps. Total area within the inner grid and perimeter line was 2.72 hectares (Smith et al. 1972) (Figure 3-4-9).

Traps were baited with rolled oats and a wad of cotton was placed at the rear of each trap for bedding material to minimize the number of deaths from hypothermia during cold weather. To provide cover during inclement weather and shade during warm daylight hours, plywood "A" frames were installed over traps during the 1976 trapping period.

Trapped animals were marked by two different methods. Animals too small to be successfully ear tagged, i.e., deer mice, voles, chipmunks, were sequentially toe clipped. Larger animals, i.e., rabbits, squirrels, woodrats, were ear tagged with sequentially numbered monel tags. During the second year of trapping it became evident that ear tags had not remained attached between trapping periods, and it was not possible to record recaptured animals by their original numbered tags. The use of numbered ear tags was therefore discontinued and toe clipping was used for larger animals as well as the smaller mammals. On larger animals a single toe was clipped during each trapping period which resulted in unique marks for each trapping period but did not supply unique marks for individual animals. Multiple toe clips were avoided in order to prevent excessive blood loss and stress to the larger animals. Because the single toe clip mark did not allow the use of the EM-2 population estimate for squirrels and woodrats, the Lincoln Index was used as an alternate population estimator for these larger small mammals.

Traps were operated on the two quantitative grids for three days during the months of June and July and for five to eight days during the months of May and August-September. A five to eight day trapping effort was necessary to yield reliable population estimates based upon recapture percentage and studies by Smith et al. (1971) and D. H. Smith (pers. comm. 1975). Maximum trapping effort was concentrated in May to assess the reproductive condition of the population and in August-September to assess the dispersal of subadults.

The EM-2 stochastic population model (Jorgensen 1976) was used to calculate small mammal densities on each grid. This model requires capture-recapture data and is based upon the following assumptions:

1) the animals and their respective age and sex classes are distributed randomly;

2) the process of trapping and marking has no effect upon the likelihood that the animal will be recaptured;

3) all animals in all classes are trappable and their respective behavioral response to the trap is the same; and

4) the population for all age and sex classes does not change during the trapping period (Jorgensen et al. 1971).

The determination of which animals are actually residents of the grid and should be included as part of the grid density estimate is made according to the laws of probability and by use of the X dense line. All animals captured less than 60 percent of the time on the dense line are considered to be residents within the grid and surrounding perimeter line (Smith et al. 1972). The use of a single dense line in this study is a modification of the original dense line design. Smith et al. (1972) utilized a system consisting of three dense lines (X,Y,Z). However, studies by Merino et al. (1974) show that a single dense line (X) with the same inner grid and perimeter line functions satisfactorily in assessing grid residency of individual animals.

The EM-2 differs from the methods of other estimators (Hayne 1949; Jolly 1963, 1965) by further partitioning certain variables such as dispersal (emigration and immigration), death rates, trap avoidance, and animal trap relationships. The EM-2 method thereby obtains a more reliable estimate.

The estimated number of marked animals, M_i is determined according to the formula:

(Eq. No. 4-1)

$$\hat{M}_i = \sum_{j-1}^{i} (n_j+k_j-m_j-l_j-r_j) - \hat{MD}_i$$

where: n_j = the number of animals caught on day i (i.e., the sample size on day i)

m_j = number of marked animals caught alive on day i

l_j = number of marked animals that left the grid on day i

k_j = number of animals that immigrated to the grid and took up residency

r_j = number of animals that die in traps on day i

The estimated number of marked animals assumed dead, $\hat{MD}_i$, is adjusted for the probability of trap avoidance, emigration, and death. Additional formulae for the above probabilities are given in Jorgensen et al. (1972).

The population size of the grid is then estimated by the formula:

(Eq. No. 4-2)

$$N_i = \frac{(n_{i+1} + k_{i+1})}{\dfrac{(M_{i+1} + k_{i+1})}{\hat{M}_i}}$$

With the assumption that a stable population exists during a trapping period, the population estimate for the last day of trapping is used since it includes all possible trapping data and is therefore considered the best estimate (Jorgensen et al. 1972).

Density, in animals per hectare, is then determined by dividing the area (2.72 hectares) into the population estimate, $\hat{N}_i$.

Confidence intervals for the population estimate are determined according to methods described by Burnham (1975, unpublished manuscript). The reciprocal of the variance of the population estimator is first calculated by the following formula:

(Eq. No. 4-3)

$$V\frac{1}{\hat{N}} = \frac{1}{\left(\sum_{i=1}^{t} N_i M_i\right)^2 \sum_{i=1}^{t} n_i \left(\frac{M_i}{\hat{N}}\right)\left(1-\frac{M_i}{N}\right)}$$

where: $\hat{N}$ = population estimate of the last day

n_i = total captures on day i

M_i = number marked in the population at the start of the i^{th} trapping day (Burnham 1975)

Continuing to use reciprocal values, the formula for determining confidence values is then utilized in the following manner:

(Eq. No. 4-4)

$$\frac{1}{C.I.} = \frac{1}{\hat{N}} \pm (2)\left(\sqrt{V\frac{1}{\hat{N}}}\right)$$

where: $\hat{N}$ = the population estimate

$V\frac{1}{\hat{N}}$ = equation (4-3)

C.I. = confidence interval at 95 percent level of confidence

The final step in confidence interval determination with this method consists of finding the reciprocal of the upper and lower limits. This results in asymetrical confidence intervals.

The Lincoln Index was used to estimate the population size of squirrels during the 1976 trapping period. This method, which utilizes mark and recapture, has the following assumptions (Overton 1969):

1. There exists a population of animals containing N individuals

2. M of these individuals are marked

3. There exists a sample of n observations of animals from the population with X observations of marked animals

4. The average probability of observing a marked animal is equal to the average probability of observing an unmarked animal.

The population was estimated according to the following formula:

$$\hat{N} = \frac{\lambda}{X} \qquad \text{(Eq. No. 4-5)}$$

where: $\lambda = (n)\ (m)$

n = number of animals in the sample

X = number of marked animals in the sample

M = number of marked animals in the population

Density estimates are calculated by dividing the effective trapping area (1.17 hectares) into the population estimate. In this case the effective trapping area is assumed to be the inner grid bordered on all sides by the radius of the average home range. Average home range of the golden mantled ground squirrel is reported to be 200 meters (Burt and Grossenheider 1964).

Confidence intervals for population estimates of golden mantled ground squirrels, where $N < 50$, were obtained from tables in Chapman (1948). These values are U and L; where U = upper limit and L = lower limit. The final formulae for calculation of confidence limits are:

$$\text{C.L. upper} = (\lambda)\ (U) \quad \text{(Eq. No. 4-6)}$$

$$\text{C.L. lower} = (\lambda)\ (L) \quad \text{(Eq. No. 4-7)}$$

A.4.2.1.2 Estimation of Relative Abundance as Represented by Trap Success on Satellite Grids

On Satellite Grids 1, 3, 4, 7, and 8 the trapping grid design consisted of a 4 x 6 array of Smith live-traps placed at 15 meter intervals. Constraints imposed by vegetation and terrain resulted in modification of this trapping grid design on the remaining satellites. Traps on Grids 5 and 9 were set in a 2 x 12 array; Grid 2 at West Stewart Creek consisted of three rows of eight traps; Grid 6, in Upper Sorghum Gulch, consisted of a single row of 24 traps.

In 1976, Grids 1 and 8, Piceance and Willow Creeks, were enlarged from 24 traps to 50 traps in a 2 x 25 array. In addition, a mark and recapture program was instituted in an attempt to quantitatively assess the microtine population.

Traps were baited with rolled oats in the evening and checked for animals the following morning. With the exception of microtines on Grids 1 and 8, animals were released without marking. Information was recorded concerning species, sex, age, and reproductive condition. Trapping periods varied from one to four days.

Trap success, i.e., the number of animals captured during a given trapping period divided by the number of trap nights was calculated for each small mammal species. The percentage trap success was then used to compare the relative abundance of each species between satellite grids. The general activity of animals, which is often related to weather (especially temperature), or such factors as bait response and trap avoidance may affect trap success appreciably. However, since comparisons of trap success were limited to similar trapping periods and trapping methods were consistent between grids, trap success was considered to be an acceptable representation of relative abundance. When the trap success was maintained at consistently high or low levels over extended periods of time, i.e., an entire active season, independent of weather, then trap success was also considered a reliable estimate of relative abundance between trapping periods as well as within a given trapping period.

A.4.2.1.3 Determination of Reproductive Condition

Reproductive condition of male rodents captured on Grids 1, 2, and on satellite grids was estimated by examining the position of their testes. Only males with scrotal testes were rated as reproductively active.

Females were rated as reproductively active if they were pregnant, lactating with swollen vulva, with mucus plug in vaginal orifice, or with regressed but open vulva orifice.

The number of embryos produced per reproductive female and the number of recent placental scars was determined for the least chipmunks and deer mice collected from snap trap lines near Grids 1 and 2. These two species were selected for more detailed studies of reproductive systems due to their abundance and widespread distribution as discussed for the studies of their food habits.

Uterine horns of all females were examined for embryos from May-August 1976. Embryo counts provided an accurate estimate of true litter size, as contrasted to estimates from trapping data, which may be influenced by subadult trap avoidance and juvenile mortalities.

The uterine horns were also examined for recent, i.e., current reproductive season, placental scars. However, these observations were made only for females collected during late summer, August-September 1975, after litter production had ceased. Therefore, by dividing the mean number of placental scars by the mean number of embryos per female an estimate of the number of litters for the current reproductive season was obtained.

A.4.2.1.4 Measurement of Live Body Weights

Live body weights of animals were recorded in the field, on Grids 1 and 2, with a Pesola spring scale read to the nearest .5 gram. The mean live weights of females were computed separately for pregnant and lactating female adults, non-pregnant female adults and female subadults. Mean live weights were also computed separately for male adults and male subadults, but not for reproductive male adults since they did not vary appreciably from non-reproductive male adults.

Live body weights were measured twice during each reproductive season, i.e., May and August-September, to obtain mean live weights for the reproductive population in May and for the post reproductive population which included dispersing subadults.

A.4.2.1.5 Calculation of Home Range Size

Home range size was calculated for the deer mouse and the least chipmunk on permanent animal trapping Grids 1 and 2. A capture history, indicating date and location of all captures, was compiled for all marked animals. Those animals which met the following criteria were initially selected for home range calculations: 1) a minimum of ten captures; 2) captures representing three different locations; 3) no greater than 50 percent of captures at one location; 4) less than 25 percent captures located on the perimeter (X-line, Figure 3-4-9, Section 3.4.3.4); and 5) no apparent shifts in home ranges.

Initial observations indicated that few animals met the criteria of ten captures. Therefore, to improve the sample size, those animals with five or more captures were subsequently included in the data base. Statistical comparisons (t-test) were conducted to determine if significant differences existed between sigma values calculated for those individuals with ten captures and those individuals with less than ten captures. The comparisons showed that when female deer mice with less than ten captures from Grid 1 are included, there is a significant shift in the sigma value from the females with greater than ten captures. All other comparisons were insignificant, indicating that one could compute home range values from five or more captures.

An initial calculation was made to determine the center of activity, i.e., a mean location from which all captures radiate (Hayne 1949). Home range size was then calculated by the method of Calhoun and Casby (1958) which utilizes the standard deviation of the normal distribution function, sigma:

(Eq. No. 4-8)

$$S_i = \left[\frac{\sum_{j-1}^{K_i} (\bar{X}_i - X_{ij})^2 + (\bar{Y}_i - Y_{ij})^2}{2\ (K_i - 1)} \right]^{1/2}$$

where: K_i = number of captures of i^{th} animal

X_{ij} and Y_{ij} = position of i^{th} animal on j^{th} capture

This sigma represents the radius of a circle within which 39 percent of an animal's activity has a probability of occurring. Similarly, a two-sigma radius will indicate an 86 percent probability of presence, and a three-sigma radius a probability of 99 percent.

After a sigma computation for each animal, a final check of the recapture radii was conducted in order to determine if any of the captures represented a long-distance excursion. The radii were converted to standard Z (Calhoun and Casby 1958) and compared to the computed sigma. If the Z was five times greater than sigma (Maza et al. 1973) that capture was identified as a long-distance excursion. It was then eliminated from the capture history and a new value of sigma determined. Following determination of sigma for each animal a mean value for each species at each site was determined.

There are two assumptions underlying the bivariate normal distribution tested. These assumptions are: X independent of Y, and variances of X and Y are equal. Tests I, II, and III (Calhoun and Casby 1958) were conducted to test individually and then in combination, the assumption that X was independent of Y or $\rho_{xy} = 0$:

(Eq. No. 4-9)

$$-2 \ln \lambda = K_i \ln (1 - r^2)$$

where: (Eq. No. 4-10)

$$r^2 = \frac{\left(\sum_{j=1}^{K_i} (X_j - \bar{X}) (Y_j - \bar{Y}) \right)^2}{\sum_{j=1}^{K_i} (X_j - \bar{X})^2 \sum_{j=1}^{K_i} (Y_j - \bar{Y})^2}$$

and the assumption that the variances of X and Y were equal or $\sigma^2{}_x = \sigma^2{}_y$ (x and y being the coordinates of the capture points):

(Eq. No. 4-11)

$$-2 \ln \lambda = K_i \ln \frac{(S_x + S_y)^2}{4 S_x S_y}$$

(Eq. No's. 4-12 and 4-13)

where: $S_y = \sum^{K_i} (y_i - \bar{y})^2 \qquad S_x = \sum_{j=1}^{K_i} (x_i - \bar{x})^2$

Statistical comparisons utilizing the t-test (Zar 1974) were computed to determine any significant differences between sexes, age classes, species, and site.

A.4.2.1.6 Determination of Survivorship and Turnover Rates

Survivorship of the least chipmunk, Uinta chipmunk and the deer mouse was calculated for animals captured on Grids 1 and 2. The mark and recapture methodology used for density estimates was employed to compile a monthly recapture history of each marked animal. The recapture history included the trapping periods from August 1974-August 1976.

For the purpose of this analysis, the persistence, i.e., length of time between first capture and last capture, was termed minimum survivorship since several factors may have resulted in an underestimate of the actual life span of individuals. Since grids were not fenced, dispersal of animals out of the trapping area undoubtedly contributed to underestimation of survivorship by some factor which represented the dispersal rate. Secondly, because the age of animals when first captured was not known, the calculated minimum survivorship only indicates the number of months the individual animals were trapped, and does not include the number of months an animal had survived before it was first trapped. Third, no trapping was attempted during winter months (October-April). Therefore, individuals which may have survived an undetermined number of months during the winter but did not survive until the first trapping period the following spring (May), were considered removed from the grid in the last month of fall trapping (September). Animals which died in the traps or animals still alive in the last trapping period were not included in the analysis.

The total number of animals marked was compiled and then the number that disappeared after one month, after two months, etc., was determined. This frequency distribution was converted to percentage values; the total sample represented by 100 percent. Using the curves based on percentages permitted comparisons of different species and between grids.

Since the life spans were not normally distributed, a logarithmic transformation was made for determination of mean survivorship used in the statistical analysis. The mean survivorship (mean life span, French et al. 1967) was considered to be the antilog of the sum of all the log life spans in the sample divided by the number of animals (French et al. 1967) and was calculated according to the following formula:

(Eq. No. 4-14)

$$10 \sum_{i=1}^{N} \left(\frac{\log_{10} \text{survivorship}_i}{N} \right)$$

where: survivorship_i = the number of months animal i was observed

N = number of animals

A.4.2.1.7 Food Habit Studies

The deer mouse and least chipmunk were species selected for study of small mammal food habits because they represented the most abundant and most widely distributed rodents in the study area. Together they comprised 85 percent of all animals marked on the two quantitative grids and were therefore the major small mammal consumers of primary production on Tract C-b.

Museum special snap traps were used to collect animals for analysis of diet items. Snap lines consisted of 25 traps located near Grids 1 and 2. All animals captured were immediately frozen to terminate the digestive process and transported to the laboratory for analysis.

In the laboratory, stomach contents of animals were emptied into a Petri dish containing alcohol and examined under 120-power magnification. The material within the dish was sufficiently agitated to insure randomization. Fifty squares (13mm x 13mm) were systematically observed in each Petri dish. The relative frequency (R) of each of the three diet categories (I = Insects, S = Seeds, G = Greenery) was calculated by using the formula:

(Eq. No. 4-15)

$$R\,(C_1) = \frac{\sum_{n=1}^{N} F_n\,(C_1)}{\sum_{n=1}^{N} \{F_n(I) + F_n(S) + F_n(G)\}}$$

where: F = the frequency of the diet category

C_1 = one of the three diet categories (repeated for each), and

N = the number of stomachs examined for that species of rodent

A.4.3 Birds

A.4.3.1 Methodology

A.4.3.1.1 Songbirds

A.4.3.1.1.1 Quantitative Songbird Censuses

Quantitative censuses of songbirds and certain nonsongbirds residing in or utilizing major vegetation types on Tract C-b and adjacent land were conducted during 11 sampling periods from October 1974 to July 1976. Ten habitats were censused for species composition and abundance according to the schedule specified in Table 3-4-18, Section 3.4.4.3.1. Descriptions of sampled habitats are given in Table 3-4-19, Section 3.4.4.3.1, and their locations are depicted on Pocket Figure 3-4-13.

During each of the first seven sampling periods, Transects 1-4, 5A, 6, 7A, and 8 were censused a single time. However, based on analyzed results of these censuses, after completion of the first year of censusing the intensity of sampling and some original transect locations were adjusted as appropriate to improve data interpretability and usefulness. The "Upland Sagebrush Vegetation Plot" transect (Transect 7A) was eliminated because its size was inadequate for meaningful censusing. This stand was not large enough to allow for an 800 m linear transect, nor could upland sagebrush stands of sufficiently large coverage for effective censusing be located within the study area. A stand of upland transition habitat (Transect 7B) of mixed pinyon-juniper and sagebrush was selected as an alternate site (Figure 1), and was censused in February, April, and late May 1976. This habitat type has a much greater coverage and distribution in the study area than does upland habitat dominated by big sagebrush alone, and therefore is more suitable for sampling the avian communities representative of the Tract C-b area.

The Middle Sorghum Gulch transect (Transect 5A) was eliminated because it did not conform to the requirement of general uniformity of physiography and vegetation for stands used in this type of quantitative censusing (Emlen 1971). Transect 5A followed a rocky drainage bottom and then traversed a fairly steep slope of sparse pinyon-juniper woodland. This transect was replaced with one that traverses a west-facing slope of relatively homogeneous pinyon-juniper woodland (Transect 5B). The location of the new transect is depicted on Pocket Figure 3-4-13.

The four principal habitat types on Tract C-b and adjacent areas are the pinyon-juniper woodland, chained pinyon-juniper woodland, bottomland sagebrush, and riparian meadow communities bordering creeks. Because these four habitats support the majority of bird species and bird numbers, the sampling effort on transects traversing them was increased during the second year of censusing. Transects 1, 2, 3, 4, and 5B were each sampled three times on consecutive days and at similar times during the eighth, ninth, and tenth censusing period. Censusing the five transects in triplicate aided in identifying the within-season variability of the avian population residing along a transect. For example, the likelihood of encountering mobile flocks and intermittently active birds increases with more exposure to an area.

At each of the census sites, a strip transect census procedure was used to provide data from which bird densities were calculated. The particular technique employed consists of slowly walking through a strip approximately 800 m long and 122 m to 244 m wide.

During the first seven sampling periods, the transects at the eight census sites were 800 m long and 244 m wide. However, based on the results of these censuses, the transect widths were adjusted at some sampling locations so as to sample a fairly homogenous habitat, as was recommended by Emlen (1971). Three transects (3, 6, and 8) were decreased in width from 244 m to 122 m. Because detections of most songbirds beyond the 122 m category rarely contribute more than a minor proportion of the total count (Emlen 1971), the elimination of the 122m to 244 m distance category was not deemed as detrimental to the censusing effort as was the continued sampling of mixed habitat types by a single transect. A Wilcoxon signed rank-sum test (Lehman 1975) was used to compare the density estimates of breeding species obtained on the transects that had width adjustments. The Wilcoxon signed rank-sum test was applied to 16 paired estimates using a normal approximation accounting for tied ranks and zero differences. It was found that modifying the strip widths leads to no significant change in population estimates (Table 3-4-22 Section 3.4.4.5.2).

The population density estimates for species observed on strip transects are determined by one of three methods described by Emlen (1971), depending on the conspicuousness of the species to the observer. Since the validity of any of these methods varies for different species, professional judgment, based on experience with the conspicuousness of various species within different habitats during different seasons, is used in selecting the best density estimator.

For species which are associated with distinctive habitat types, are conspicuous, and occupy large activity areas, Method "A" usually provides the best density estimate. This method assumes that because of their conspicuousness and activity, all individuals occupying the strip transect area are tallied by the censuser. Thus, the method simply involves division of the total number of individuals seen on the transect by the total area of the transect to obtain estimates of number per km^2. To determine number per hectare (#/ha), a factor of 0.1 is multiplied by the number of birds observed.

Method "B" recognizes that most species become less and less conspicuous over distance and therefore have a decreasing probability of being recorded with increasing distance from the transect route. Thus, a coefficient of detectability (C.D.), the proportion of a species' population which is ordinarily detected by an observer, is used to adjust the estimate obtained by Method "A". The coefficient of detectability is based on the distribution of detection points perpendicular to the transect. The transect route bisects the transect area, which is divided into a series of strips parallel to the central route. The strip widths, presented as distances from the central transect route, are 0 - 8 m, 8 - 15 m, 15 - 30 m, 30 - 61 m, 61 - 122 m, respectively. It is assumed that all individuals of a species observed in strips preceding and including the strip containing the greatest number of birds for that species represent the total number of birds present within those strips. This sum, termed the basal plateau level, is extrapolated to the limits of the entire census band (800 m by 122 m or 244 m) so that the resulting figure represents the projected number of birds for a species within the entire transect. Coefficients of detectability were then determined by dividing the observed number of birds within the transect by the projected number. The C.D. thus represents the efficiency of the census for a particular species. Dividing the density estimates obtained in Method "A" by the coefficient of detectability provides an adjusted population density estimate (Emlen 1971).

The coefficients of detectability presented in this report differ slightly from those presented in previous reports (C-b Shale Oil Project, 1976a, 1976b, 1976c, 1976d). Previously, little historical data were available on the detectability of each species within each habitat during each season, so coefficients of detectability were determined directly from the data collected during each sampling period. This resulted in different yearly coefficients for a species within a habitat type during a particular season. However, the detectability of a species should only vary between different habitats and different seasons, not within a particular habitat and season (Emlen 1971). To alleviate this variability, the two-year seasonal data for each habitat type were combined with data from strip transects recently conducted within similar habitat types in northwestern Colorado (Ecology Consultants Incorporated, 1976a, 1976b; Rio Blanco Oil Shale Project 1976a, 1976b, 1976c, 1976d; Rocky Mountain Energy Company 1976; Stearns-Roger, 1975; Union Oil Company of California 1975). New coefficients of detectability were then calculated using exactly the same procedure and the population density estimates were adjusted accordingly.

When the assumption of complete censusing of birds of a species close to the transect route cannot be met, such as in instances of particularly shy or retiring species, Method "C" is employed for density estimation. This method involves multiplication of the estimate obtained in Method "B" by an additional adjustment factor, the basal detectability adjustment. This method adjusts for those species whose conspicuousness diminishes rapidly past some critical distance from the transect route; these birds may not be seen unless they flush nearly underfoot. Emlen (1971) suggested that the basal detectability adjustment should rarely exceed 1.2 for wintering birds and should average about 1.5 for breeding bird populations because of the inactivity of females and the intermittent singing of the males. For those species warranting this correction, values of 1.2 and 1.5 were applied for wintering and breeding birds, respectively.

Once a population density estimate was computed, it was used to determine the percentage relative abundance (% R.A.) for each species. As employed here, % R.A. is defined as follows:

(Eq. No. 4-16)

$$\% \text{ RA} = \frac{\text{Density of species A}}{\Sigma \text{ Density of all species}} \times 100$$

The Shannon-Weiner calculation (Pielou 1966) was used to compute indices of species diversity (H'), maximum diversity (H' max), and equitability (J) for each habitat type sampled by strip transect procedures.

Wilcoxon's rank-sum test (Lehman 1975) was used to test the comparability of density estimates one year apart during the breeding season for the two species exhibiting the highest importance values within the six habitat types sampled during both breeding seasons. The test was used on the twelve paired estimates using a normal approximation accounting for tied ranks and zero differences.

Wilcoxon's rank-sum test was also used to test the comparability of common species on the two pinyon-juniper transects during 1976. Common species were defined as those species observed on a minimum of two of the three census replications on both transects. Since the null hypothesis is one of no difference, raw counts were used to eliminate any possible differential effects caused by different coefficients of detectability. The test was applied to paired counts of 11 species, using a normal approximation accounting for tied ranks.

A.4.3.2 Data Quality

A.4.3.2.1 Quality Assurance

A number of activities are routinely performed to assure that field data are obtained using standardized, repeatable methodologies, that data records are complete, and that data analyses are accomplished correctly and accurately. Collectively, these activities constitute a project-specific quality assurance program. These activities include:

- Marking all strip transects and road transects with flagging to permit precise repeatability of field survey routes.
- Use of a rangefinder during conduct of initial strip transect censuses, to "calibrate" distance estimation skills of the observer with actual distance measurements.
- Field audits of the project ornithologist by another party using audit procedures specified in Ecology Consultants, Inc.'s Quality Assurance Manual. These audits determine whether conduct of field work and field schedule is in conformance with procedures specified for work on Tract C-b, and specify corrective action when variances are ascertained.
- Use of standard field data forms to assure that all necessary information is recorded at the time of field work.
- Checks of field data forms by and independent party to assure that forms are complete and legible.
- Duplication of all data sheets to minimize chances for irreparable data loss.
- Editing of computerized data lists to assure correctness of data transfer from field data sheets to computer tape.
- Computer analysis of strip transect and species diversity data to eliminate chances of human error; production of data tables via computer-activated typewriter to eliminate errors in summary data tabulation.

- Analysis of a known-value data set prior to computer analysis of strip transect data, to check possible computer misfunction.

A.4.3.2.2 General Data Efficacy

Use of coefficients of detectability and basal detectability adjustments to correct incomplete tallies of inconspicuous species within the transect generates data having much greater resolution than data resulting from standard transect methods. Nevertheless, a number of factors may still influence the accuracy and utility of data used to calculate population abundances of animals, and birds in particular. Certain factors are intrinsic to the field and data analysis methodologies employed; the best available methodologies incorporate routines or procedures which maximize data utility and application. Other factors are determined by circumstances extrinsic to the sampling technique used. Extrinsic factors become especially influential in reducing the confidence one can place in data on abundance whenever the studied organisms have capability for movement over long distances, or when behavioral traits cause population aggregations which lead to extremely patchy occupancy of satisfactory habitat.

Because birds are highly mobile and during the nonbreeding season often exhibit extreme nonuniformity in their distribution patterns, density estimation becomes risky, thus it is often necessary to qualify the meaning of bird density values derived from even the best field census procedures. In the data interpretation section, occasional qualifications are made as deemed necessary. Here, a brief generic-level treatment of potential data limitations is presented.

A.4.3.2.2.1 Winter Mixed-Flock Behavior

Commencing in late fall and continuing until early spring, many permanent and winter resident species of the Piceance Basin congregate in mixed-species flocks. These flocks are usually nonstationary; the individuals comprising them exploit food resources in a very localized area for a few hours, or in the case of a rich food source, longer periods, before moving en masse to another feeding or roosting location. The resultant pattern of distribution accounts for vast areas of Tract C-b remaining devoid of birds at a particular time, while a number of small areas temporarily support dense congregations. Field data obtained during the winter period generally reflect the inconsistent patterns of habitat utilization caused by this dynamic behavior of winter flocks. Few or no birds will be tallied along some 0.8 km transects, while other transects, which fortuitously include a mobile winter flock within the censused strip, will tally a large number of individuals. Moreover, reduced visual and audible conspicuousness of individual birds that do not flock, as compared to birds that do, decreases their potential of being observed. Consequently, individual conspicuousness and flock conspicuousness will strongly influence the species which are recorded, and their population numbers (Brewer 1972), despite careful field work and application of coefficients of detectabilities. Add to these extrinsic factors the generalized nature of habitat utilization exhibited by wintering birds, plus temporal avoidances by individuals and flocks of windswept habitats such as chained pinyon-juniper woodlands and upland sagebrush communities, and the interpretation of population densities in a given habitat becomes clearly in need of qualification. Unfortunately, practical field techniques which can resolve these specific problems remain unavailable, despite intensive efforts by field ornithologists to perfect them.

A.4.3.2.2.2 Migratory Behavior

Generally, during migration, species do not exhibit the well-defined habitat preferences and attachment to specific locations shown by them during the breeding season. Results of censuses made during this period must thus be viewed with cognizance of certain basic characteristics of bird migration. During migration, many nocturnally migrating species stop their directional movement each morning to feed and rest in loosely organized flocks; these flocks move along topographical features such as drainages or ridges. Similar to patterns exhibited by mixed winter flocks, bird distribution during periods of migration often is highly clumped or aggregated, and large areas of seemingly appropriate habitat support no birds at a given moment while a relatively small area may contain extremely high densities of birds. As a consequence, a series of bird density estimations, determined over a number of successive migration periods, must not be interpreted as providing data that are directly comparable for long-term trends.

Moreover, species composition within a region during migration is dynamic, as an assemblage of migrant species can quickly be replaced by a wave dominated by entirely different species. Densities can also vary markedly from day to day during migration, as bird numbers increase in an area when poor weather stalls advance, and decline abruptly when favorable weather conditions promote exodus. This dependency of migratory dynamics on weather conditions has been well documented (Curtis 1969, 1970; Hassler et al. 1963). The exact path which a flock of birds takes, and therefore the location of a stopping point along the migratory route, may also be determined by the extent to which the migrating flock is displaced by winds (Graber 1968).

A consequence of avian population dynamics during migration is that migrant species' density values are of limited use--they represent an estimate of bird numbers at a single pulse in time and at a spatial scale entirely too small for logical treatment, since many species' migrant movements are actually of continental scale. Hence, census results by any method from periods of autumn and spring migration are not appropriately used as baseline data, but are, nonetheless, important to satisfy the requirement that an inventory be made of species utilizing Tract C-b habitats during migration.

A.4.3.2.2.3 Wide-Ranging Species

Most birds of prey range over wide areas during hunting activities. A single golden eagle, for instance, may traverse as much as 32 km^2 in the course of daily hunting. Such movements over large areas preclude effective estimation of population densities by any census method that is restricted to specific vegetative communities. Because strip transect data on birds of prey are not amenable to density estimations, tallies of buteos, accipiters, eagles, and falcons made during transect censuses were excluded from calculations of bird densities at each of the eight transects.

A.4.3.2.2.4 Aerially Feeding Species

Nighthawks, swifts, and swallows feed by capturing insects on the wing, so most tallies of these species involve observations of birds in flight. Because these species sometimes concentrate in areas of insect congregations, censuses of transects supporting such temporary concentrations tend to overestimate densities of these species. Overestimates of this nature result from all census techniques which tally numbers of swallow-like birds.

Based on conclusions from discussions presented above, density data derived from migration and winter periods must be carefully qualified. Conversely, because breeding birds exhibit tenacity to territories and are dispersed throughout their preferred habitat, quantitative data on certain permanent and summer resident species' densities obtained during the nesting period are usually reliable indicators of abundances, given qualifications indicated below which relate to intrinsic limitations of specific strip transect methodology being employed.

A.4.3.2.2.5 Habitat Heterogeneity

Censuses aimed at establishing avian densities assume that the habitat being sampled is homogeneous and characteristic of the vegetative community of interest. The strip transect methodology employed in the Tract vicinity requires a relatively large sampling area. Careful placement of transects within large blocks of relatively homogeneous communities has minimized inclusion of multiple habitats within a single transect. Nonetheless, patches of dissimilar habitats resulting from plant responses to discontinuities in soil, moisture, slope, etc., are interspersed within most transects. These patches sometimes attract species which are not characteristic of the specific habitat being censused, and occassionally such species are tallied during the census.

A.4.3.2.2.6 Overestimations from Single Sightings in Innermost Transect Strip

The extrapolation of basal plateau level values to the entire transect width tends to produce overestimates of density when a species is observed only once or twice, and sightings are confined to the strip closest to the transect route. For species tallied a number of times on a transect, this problem does not arise. To reduce the magnitude of such overestimations, sightings in the two innermost strips were combined for the purpose of calculating density.

A.4.4 Amphibians and Reptiles

A.4.4.1 Methodology

A.4.4.1.1 Estimation of Relative Abundance by Line Transect Counts

The relative abundance of reptile species was estimated from line transect counts. Line transect counts were conducted by counting all lizards observed on small mammal grid lines (ten parallel, 150 meter transects) during two-hour observation periods. Observations were made during morning hours (approximately 1000-1200 hours) when lizards were occupying sunning stations and were most easily observed. Counts were conducted for three consecutive days.

The mark and recapture technique for estimating density of lizards was attempted in 1975 but was discontinued after recapture efforts resulted in less than 2 percent of marked animals recovered. Several factors which may have contributed to this low recapture success are discussed in the results section. Line counts which were subsequently used have given satisfactory estimates of relative abundance in previous studies (Turner and Medica 1971) and also proved reliable in current studies.

Identification of reptile and amphibian species not observed on the grids, and species distribution over the range of habitats represented in the study area, were determined by opportunistic observations made during the course of related studies. Habitats which were most likely to support amphibian species, such as riparian areas and ponds, were emphasized when general surveys were conducted.

A.4.5 Terrestrial Arthropods

A.4.5.1 Methodology

A.4.5.1.1 Estimation of Relative Abundance for Ground Dwelling Arthropods

To collect and identify ground arthropods a 7 x 7 grid of pitfall traps, spaced 15 meters between pitfalls, was established. Plastic containers, with a diameter of 19.5 cm and 19.5 cm in depth, were used for pitfalls. Containers were buried flush to ground level and covered with a sun shade, i.e., a 30 cm square piece of plywood, to attract ground dwelling arthropods seeking cover and shade.

Pitfalls were opened in the morning, left open for 48 hours, inspected, then emptied. Those arthropods collected were placed in vials filled with alcohol and returned to the laboratory for identification. During the six to eight day small mammal surveys in the spring and late summer, pitfalls were operated for two 48-hour trapping periods. To compare data from sampling periods with unequal trapping efforts all data is reported as individuals captured per 100 pitfall trap days. One pitfall day represents one pitfall operated for 24 hours.

A.4.5.1.2 Estimation of Relative Abundance for Shrub Dwelling Arthropods

Arthropods were collected from the three shrub species most heavily browsed by mule deer: mountain mahogany, serviceberry, and big sagebrush. Three different shrubs of each major browse species were sampled. Shrubs were sampled by beating branches to dislodge arboreal insects and cause them to drop into a 40 cm diameter beating net held beneath the shrub. Each shrub was beaten 33 times for a total of 99 beats per species with one beat added for a total of 100. The beating was done by the same individual each time to reduce variability. Arthropods collected from the nets were placed in vials filled with alcohol and transported to the laboratory for identification.

During six to eight day small mammal surveys in the spring and late summer, shrub species were sampled twice. To compare data from periods with unequal sampling efforts all data were reported as individuals captured per 100 beats.

A.4.5.1.3 Calculation of Species Diversity

Relative comparisons of the diversity of arthropods between sites and shrub species were made by the use of a species diversity index. The index used (Shannon 1948) gives an indication of the distribution of observations among categories (Zar 1974), the observations being the number of arthropods and the categories being the arthropod taxa. Based upon information theory, the formula is:

(Eq. No. 4-17)

$$H = -\sum_{i=1}^{k} p_i \text{ Log } p_i$$

where: K = number of categories

$p_i = f_i/n$

n = sample size

f_i = number of observations in each category

Kruskall-Wallis analysis-of-variance and non-parametric multiple comparisons were utilized to statistically determine differences between sites and/or shrubs for the arboreal arthropods.

Pitfall arthropod samples were tested to determine if a difference existed between samples obtained from Sites 1 and 2 with a Mann-Whitney U test.

A.5 Aquatic Ecology

Bimonthly collections of fish, benthos, periphyton, water samples, and algae from the sampling stations were conducted during the period from August 1974 to July 1976 (Woodward-Clyde Consultants 1974, 1975a, 1975b, 1975c, 1975d, 1976; Shell Oil Company, 1976a, 1976b, 1976c).

A.5.1 Sampling Stations

Twenty sampling stations were established for this study. Monthly collections were begun in August 1974. Sampling was changed to a bimonthly program in January 1975. The location and a description of each sample station are given below. The sample stations are shown on Pocket Figure 3-5-1.

A.5.1.1 Station P-0 (NW¼, S1, T4S, R95W)

Piceance Creek, just above the confluence of Piceance and Cow Creek. Substrate consists of mud, gravel, and rubble. Several beaver dams exist in this area, forming small pools in the creek. The station is located approximately 10 miles upstream from the Tract C-b boundary. Trees and shrubs shade the stream at this station. This station was not a regular sampling station, but was used occasionally to study upstream conditions.

A.5.1.2 Station P-1 (NW¼, SE¼, S3, T3S, R96W)

Piceance Creek, about one mile upstream from Stewart Gulch Road. Substrate consists of small rubble, mud, and compacted clay. Grass and low shrubs line the banks. Located approximately one mile outside of Tract C-b boundary. Station II of Everhart and May (1973) is approximately 2¼ miles upstream from this station.

A.5.1.3 Station P-2 (SE¼, SE¼, S32, T2S, R96W)

Piceance Creek, at the Walter Oldland Ranch, below the confluence of Stewart Creek. Substrate consists of mud and compacted clay with some gravel and rubble. Grass and low shrubs line the banks. Corresponds roughly to Station PC-1 of Woodling and

Kendall (1974).

A.5.1.4 Station P-3 (SW¼, SW¼, S32, T2S, R96W)

Piceance Creek, below Sorghum Gulch drainage. Substrate consists of small to medium rubble with some mud and clay. Some pools and riffles occur in this stretch and there is a small waterfall at the upper end of the station. Grass and low shrubs line the banks.

A.5.1.5 Station P-4 (SE¼, SE¼, S31, T2S, R96W)

Piceance Creek, below the Redd Ranch, near the meteorology station. Substrate consists of small rubble and mud. Grass and low shrubs line the bank. This station was moved and designated P-5A in November 1974 due to similarity between Stations P-3, P-4 and P-5. Station P-5A was added to provide a station on a stretch of stream below a waterfall, a habitat of narrow distribution not represented in the other Piceance Creek stations.

A.5.1.6 Station P-5 (NE¼, SE¼, S36, T2S, R97W)

Piceance Creek, approximately one mile above the confluence of Willow Creek and Piceance Creek. The substrate consists of small flat rubble, mud and compacted clay. Grass and low shrubs line the bank.

A.5.1.7 Station P-5A (SW¼, SW¼, S25, T2S, R97W)

Piceance Creek, approximately 300 yards above the confluence of Willow Creek and Piceance Creek, downstream of the entrance road leading to Tract C-b. Substrate consists of flat rubble, gravel, mud, and compacted clay. There is a man-made waterfall resulting from stream diversion approximately 12 feet high at the upper end of the station. There is a pool beneath logs at the base of the waterfall. Most of this station is shallow riffles below the falls. Grass and small shrubs line the bank. This station was established in November 1974 when Station P-4 was discontinued. Station III of Everhart and May (1973) is approximately 3/4 mile downstream from this station.

A.5.1.8 Station P-6 (NW¼, SW¼, S26, T2S, R97W)

Piceance Creek, approximately one mile below the confluence with Willow Creek, where the Hunter Creek Road crosses the stream at USGS gauging station No. 09306061. Substrate consists of mud, compacted clay and some gravel. Grass and low shrubs line the bank. Corresponds roughly with Station PC-2 of Woodling and Kendall (1974). Station 12 of Pettus (1974) is approximately 1-3/4 miles downstream from this station.

A.5.1.9 Station P-7 (NE¼, NW¼, S21, T1S, R97W)

Piceance Creek, 7.8 miles downstream of Station P-6 along the Piceance Creek Road. Substrate consists of mud and compacted clay. Grass and low shrubs line the bank. Station IV of Everhart and May (1973) is approximately three miles upstream from this station.

A.5.1.10 Station WR-1 (SE¼, NW¼, S36, T2N, R97W)

White River, approximately one mile above the confluence of Piceance Creek and the White River, where Piceance Creek Road crosses the White River. Substrate consists of small to large rubble, boulders, and sandy silt in the interstices. Grass and shrubs line the bank. This station corresponds roughly with Station VI of Everhart and May (1973) and Station 4 of Pennak (1974).

A.5.1.11 Station WR-2 (SE¼, SE¼, S34, T2N, R97W)

White River, approximately one mile below the confluence of Piceance Creek and the White River, where State Highway 64 crosses the White River. Substrate consists of small to large rubble and sandy silt. The river splits into several channels at times at this station. Grass and willow line the banks. This station corresponds roughly with Station 4 of Pettus (1974) and Station 3 of Pennak (1974).

A.5.1.12 Station W-1 (SE¼, NE¼, S22, T3S, R97W)

Willow Creek, approximately one mile upstream from the boundary of Tract C-b. Substrate consists of small, well-embedded rubble. The stream is spring fed. Width is generally less than three feet and depth less than one foot. Grass and small shrubs line the bank. Watercress and aquatic plants grow in the stream in spring and summer.

A.5.1.13 Station W-2 (NE¼, SW¼, S2, T3S, R97W)

Willow Creek, below the confluence of the drainage from Scandard Gulch, just outside the Tract boundary. The substrate consists of sandy silt and gravel. At this station the stream flows through a gulch cut into the meadow floor about 30 feet deep. The stream is generally less than three feet wide and one foot deep. A small waterfall about four feet high marks the upper end of the station. Grass and small shrubs line the banks. Aquatic plants grow in the stream in spring and summer.

A.5.1.14 Station W-3 (SE¼, SE¼, S26, T2S, R97W)

Willow Creek, just above the confluence of Willow Creek and Piceance Creek. Substrate consists of gravel and sandy silt. The stream is generally less than three feet wide and one foot deep. Stream banks are lined with grass, shrubs and willows. The stream becomes overgrown in summer in some places. Aquatic plants are much less frequent than at Stations W-1 and W-2. This station corresponds roughly to Station WC-1 of Woodling and Kendall (1974).

A.5.1.15 Station U.W.L. (SW¼, NW¼, S14, T3S, R97W)

Upper Willow Lake, approximately one mile downstream from Station W-1. Upper Willow Lake is a shallow spring-fed, man-made impoundment of about a half-acre. It has a black sandy and muck bottom that is rich in organic detritus. A small weir at the opposite end from the spring source drains water into Willow Creek. The lake bank is flat and lined with grass and some shrubs. Aquatic vegetation is abundant in the lake.

A.5.1.16 Station L.W.L. (NW¼, SE¼, S11, T3S, R97W)

Lower Willow Lake, approximately one mile north of Upper Willow Lake, is a small (0.1 acre) spring-fed pond about 10 feet deep. The spring source is in the bottom of the pond. It has a sandy and muck bottom that is rich in organic detritus. Green algal growth is abundant on the lake bottom. The lake bank is flat and grass covered. The lake drains through a small channel into Willow Creek.

A.5.1.17 Station S-1 (SE¼, SE¼, S5, T3S, R96W)

Stewart Creek, approximately one mile up Stewart Gulch from the Walter Oldland Ranch, where the road to the west fork of Stewart Gulch crosses Stewart Creek at USGS gauging station No. 09306022. Substrate consists of small embedded rubble and some sandy silt. Stream banks are grass covered. Aquatic plants grow in the stream in spring and summer. Stream width is generally less than three feet and depth less than one foot. Stewart Creek is spring fed. This station corresponds roughly with Station SG-1 of Woodling and

Kendall (1974).

A.5.1.18 Station S-2 (SE¼, SE¼, S32, T2S, R96W)

Stewart Creek, just upstream from the confluence of Stewart Creek and Piceance Creek. Substrate consists of sandy silt and gravel. This portion of Stewart Creek flows through a grassy meadow. The channel draining Lower Stewart Lake joins Stewart Creek at this station.

A.5.1.19 Station U.S.L. (SE¼, SW¼, S9 T3S, R96W)

Upper Stewart Lake, in middle fork of Stewart Creek Gulch. The lake is a spring-fed, man-made impoundment of approximately two acres. The substrate is mud and silt, rich in organic detritus with abundant attached algal growth and aquatic plants. The lake bank is a grassy meadow.

A.5.1.20 Station L.W.L. (NE¼, NE¼, S5, T3S, R96W)

Lower Stewart Lake, located about a quarter-mile south of Piceance Creek Road along the Stewart Gulch Road near USGS gauging station No. 00306007 on the Walter Oldland Ranch. Lower Stewart Lake is a man-made impoundment about an acre in size. The substrate consists of small flat rubble and silt. The lake drains into a channel which flows into Stewart Creek. The lake has attached and and floating algal growth as well as aquatic plants. Depth of the lake is about 10 feet.

A.5.2 Water Quality/Sediments

Water samples were collected at each station. The samples were taken near the third Wednesday of the month so as to coincide with water quality analyses performed by the U. S. Geological Survey (USGS) for the same area. Measurements of dissolved oxygen and temperature (using a Yellow Springs dissolved oxygen meter, Model 51A), pH (using a Photovolt meter, Model 125), and specific conductivity (using a DREL-2 Hach Kit), were made in the field at the time of collection. Water samples for further analysis were placed in one-quart plastic containers and put on ice. Laboratory analysis consisted of quantitative determination of 29 parameters (Appendix IV-B, Table B-5-35). Procedures conformed to those specified in APHA Standard Methods (1975) and EPA (1971).

Sediment samples were collected from all stream and lake stations beginning in May 1975. Surface samples were dug by hand trowel to a depth of about six inches. Samples were sealed in bags and placed on ice for analysis in the laboratory.

Laboratory analyses (Appendix IV-B, Table B-5-35) included determinations of moisture content, C.O.D. (chemical oxygen demand), TKN (Total Kjeldahl Nitrogen), and volatile solids (APHA Standard Methods 1975). Subsamples were dried in an oven and sieved through U. S. Standard sieves on a Tyler shaker. On selected samples, an emission spectograph scan was run for detection of heavy metals.

A.5.3 Plankton

Plankton samples were collected at each station by filtering 20 liters of water through a #20 mesh (75 micron) plankton net. Samples were preserved with formalin and stored for later analysis. Although samples were not analyzed, they are stored at Woodward-Clyde Consultants, San Diego.

Planktonic primary productivity was estimated in the four lake stations using the light and dark bottle technique. Two light (transparent) and two dark (opaque) bottles were exposed for up to 24 hours at each lake station. Dissolved oxygen was determined before and after exposure by the Azide modification of the Winkler method (APHA 1975).

A.5.4 Periphyton

Periphyton (attached plants and microinvertebrates) were collected from each station by removing six glass slides (2.54 X 7.62 cm) from a plexiglass holder which had been immersed in the stream for about a month (Appendix IV-B, Figure B-5-21). Three of the six slides were preserved in vials of formalin for later taxonomic work. The other three slides were air-dried and stored for biomass analysis. This entailed drying overnight at 110° C and scraping the periphyton from each slide separately into a prepared weighing dish. The material was weighed to the nearest ten-thousandth of a gram (0.0001). The weights were converted to grams per square meter by the formula:

$$\frac{\text{mean weight of samples (gm)}}{\text{area of slide (cm}^2\text{)}} \times 10{,}000 \qquad \text{(Eq. No. 5-1)}$$

Periphyton primary productivity in the streams and lakes was being measured by the biomass accumulation technique (APHA Standard Methods 1975, Sladecek and Sladeckova 1964). This method utilizes accumulation of periphyton on glass slides. Net productivity was determined from the ash-free weight of periphyton material accumulated per unit area.

A.5.5 Benthos

Benthic macroinvertebrates (bottom-dwelling organisms) were collected at all stations with a Surber square-foot streambottom sampler (Needham and Needham 1962). The apparatus utilizes the stream's current to wash the benthic organisms into a net (Appendix IV-B, Figure B-5-21). The larger stones enclosed in the square foot area were washed and discarded. The remaining substrate was gently churned up to dislodge burrowing organisms. Samples were taken in triplicate at each station for statistical comparison. Samples were preserved in isopropyl alcohol and returned to the laboratory. Since many other studies have utilized the Surber sampler, the results of this survey will have comparative value. Identification, enumeration, species diversity, and biomass determinations (weight/square foot) were conducted in the laboratory).

A.5.6 Fish

A variable-voltage, DC battery-operated backpack shocker Model BP-2 (Coffelt Electronics Co., Denver) was used to collect fish from all stream stations (Pocket Figure 3-5-1) bimonthly. Sieves with 0.5-inch mesh are used to collect fish at some stations. These seines are 6 x 100 feet and 6 x 50 feet in size.

A 100-meter stretch of the stream was fished with the backpack shocker at each station (Appendix IV-B, Figure B-5-22). This gave a quantitative measure of number of fish per 100-meter stretch of the stream. Fish were kept in a live-box until they were weighed, measured and tagged. Selected fish were preserved for stomach analysis and examination of reproductive condition. The remainder were returned to the stream. Fish were examined for external parasites. Dissected specimens were also examined for internal parasites.

To detect any migration of fish as stipulated in the oil shale lease, selected fish were marked and released. In initial collections, fish were marked by clipping of one ventral fin. In May 1975 a tagging method of marking was initiated. Tagging of fish allows for identification of individual fish in subsequent recoveries. Two types of tags were used, depending on the size of the fish: Floy Anchor Tags FD-67C and Fingerling Tags FTF-69 (Floy Tag & Mfg., Inc., Seattle). In most cases fingerling tags were used. Fish were anesthetized in MS-222 (Tricaine Methane Sulfonate) for tagging and then revived and released. MS-222 (in powder form) was mixed in a container of water at a dosage of 0.5-1.0 gm/gallons

H_2O (Bell 1973). Fish were placed in the container for two to four minutes until they resumed normal swimming activity. Anchor tags were inserted with a gun on the left side of the fish below the dorsal fin. Fingerling tags were tied through the fish's back anterior to the dorsal fin by use of a steel needle. Appendix IV-B, Figure B-5-23 shows the method of tagging. Fish were dipped in malachite green solution (1 gm malachite green/4 gallons water [1:15,000]) for 30 to 60 seconds to prevent fungus growth due to handling and tagging operations prior to being released (Davis 1970). The recapture of tagged fish in later samples would provide necessary information on migratory patterns, and provide a means of estimating the population.

Fish retained for further study of reproductive state, determination of sex ratios and stomach analysis were preserved in 10 percent formalin solution. Stomachs were removed from the fish when freshly caught and preserved. Food habits of selected fish were determined by stomach analysis using the numerical, percent by bulk, and volumetric methods as discussed by Lagler (1956). Organisms were identified and counted and volume of the stomach contents was determined.

Fecundity estimates of spawning fish were made by the gravimetric method (Lagler 1956) using subsamples from the ovary for direct enumeration.

The DeLury (Lagler 1956) and Petersen methods (Lagler 1956, Ricker 1968a) were used to estimate fish populations. The DeLury method depends on the reduction in the catch in successive fishing efforts but cannot be used unless the decrease in population size is reflected in the successive efforts. This method involves fitting a regression line to the catch per unit of effort data and extrapolating to estimate the population. The computer method using the formulae developed by Zippin (1958) for the multinomial method was used. The population estimate and confidence interval (95 percent level) were computed treating each species separately. The estimates for each species were combined to get an overall total population estimate.

Three replicate fishing efforts were conducted at selected stations. A 100-meter stretch of stream was blocked off with seines and electrofishing was conducted for three successive fishing efforts on the 100-meter stretch.

The mark-recapture method (Petersen method) involved the capture and release of marked (or tagged) fish into the population and the recapture of marked fish in subsequent resampling of the population. Tagging and recapture was being conducted for the last year of the study. The population size was calculated by the formula of Chapman (Ricker 1968b):

$$\hat{N} = \frac{\Sigma\ (C_t M_t)}{R + 1} \qquad \text{(Eq. No. 5-2)}$$

where:

$\hat{N}$ = population estimate

M_t = number of marked fish at large at the start of the t^{th} day

C_t = number of fish captured on day t

R = ΣR_t, the total recaptures during the experiment.

A.5.7 Springs and Seeps

As part of the baseline studies, springs and seeps in the vicinity of the Tract were identified and examined. They were studied to determine aquatic organisms which were present. In addition, selected water quality data were collected at each site for comparison with existing water quality at aquatic sampling stations. Some of the major springs were incorporated into the aquatic sampling programs as regular lake sampling stations. Others were seasonal in nature and were examined on an irregular basis. A total of 12 springs and seeps in the Tract vicinity were enumerated. Locations of identified springs and seeps are listed below:

Piceance Springs

Spring 1 - Seepage along eastern edge of Lower Stewart Lake (LSL). No vegetation. Substrate of small shingle. Lake itself was sampled by aquatic team. Seepage source was inundated at high lake levels.

Spring 2 - Spring at Savage Cabin, Stewart Gulch. Four main sources which converge and flow into Middle Stewart Gulch. Choked with watercress (Nasturtium officinale).

Spring 3 - Spring issuing from concrete structure against hillside at mouth of Stewart Gulch. Behind ranch house. Watercress present.

Spring 4 - Seep-forming marsh at mouth of East Stewart Gulch. Rushes (*Carex*). Not sampled since no pool or stream channel present.

Spring 5 - Spring issuing from concrete structure behind Oldland Ranch house. A few meters from Spring 3. Similar to Spring 3.

Spring 6 - Spring at mouth of Willow Creek west of PL Ranch. Issues from hillside above pond northwest of ranch house. Gravel substrate.

Spring 7 - Spring at PL Ranch. Choked with watercress.

Spring 7a- Limnocrene (man-made?). Approximately 50 meters south of Spring 7. Approximately one meter deep. Bottom covered with Charales. Watercress along edges in some spots.

Spring 8 - Spring at Willow Creek at mouth of Scandard Gulch. Gravel bottom at source - watercress appears about two meters from source.

Spring 9 - Limnocrene along Willow Creek. Sampled by aquatic team as Lower Willow Lake (LWL).

Spring 10- Willow Creek two miles south of Scandard Gulch. Flows few meters into Upper Willow Lake. Much watercress.

Spring 11- Seep forming a *Carex* marsh southeast of Savage Cabin, Stewart Gulch. Not sampled since no well-defined channel or pool.

Spring 12- Seep immediately to the southeast of Spring 11. Similar to Spring 11. Not sampled.

APPENDIX B

TABLE B-1-1

MEAN, MEAN MAXIMUM AND MEAN MINIMUM SURFACE TEMPERATURES, 1975-1976

MEAN MIN °C	1975												1976								
	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
PINYON JUNIPER WOODLAND	-6.6	-3.6	-1.4	2.8	5.4	5.9	1.8	-2.1	-3.3	-3.9	-6.1	-4.9	-2.6	-3.3	-0.3	3.7	4.1	8.4	9.7	1.8	2.4
CHAINED PINYON JUNIPER RANGE-LAND	-1.4	0.2	0.1	2.6	8.5	4.5	-0.2	-4.2	-3.2	-4.0	-4.5	-7.0	-3.2	-5.9	-1.6	3.8	7.2	7.4	-0.1	-4.7	-11.2
BOTTOMLAND SAGEBRUSH	-3.4	-5.6	-3.5	2.0	5.0	5.2	3.2	0.5	-2.0	-0.7	-2.9	-3.0	1.6	-2.1	-2.2	8.0	11.2	-0.2	-5.3	-10.4	-17.2
UPLAND SAGEBRUSH	-1.0	0.2	2.9	6.8	12.6	10.1	16.1	6.0	3.0	-0.3	-1.3	-1.7	-0.5	-0.6	-1.0	5.1	6.7	5.0	1.7	-6.3	-10.1

MEAN MEAN °C	1975												1976								
	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
PINYON JUNIPER WOODLAND	-4.7	-1.8	4.6	12.8	19.3	22.2	14.2	9.7	2.9	-2.7	-5.1	-4.0	-1.8	3.9	10.3	16.8	17.2	20.7	23.3	14.6	14.2
CHAINED PINYON JUNIPER RANGE-LAND	0.8	3.6	11.6	15.2	22.5	20.6	14.2	8.2	-1.9	-1.2	-3.4	-2.3	-0.1	5.2	9.4	16.8	23.9	20.9	18.9	9.4	1.4
BOTTOMLAND SAGEBRUSH	0.8	-1.8	8.2	13.5	-	20.2	15.6	-	0.9	0.5	-2.0	-1.7	2.4	4.6	10.9	18.3	22.0	11.5	8.2	-3.8	0.8
UPLAND SAGEBRUSH	-0.5	1.5	7.0	12.4	24.5	24.8	29.4	19.9	-	0.2	-0.6	-0.7	0.5	3.9	10.5	17.8	20.3	20.3	14.6	6.3	2.0

MEAN MAX °C	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
PINYON JUNIPER WOODLAND	-2.3	1.5	14.8	29.0	44.8	49.0	39.2	35.8	15.3	-1.2	-4.1	2.7	-0.8	18.5	31.1	40.1	39.4	43.5	48.1	36.3	31.6
CHAINED PINYON JUNIPER RANGE-LAND	5.0	9.4	29.8	33.6	43.3	46.5	37.7	27.1	-0.7	3.3	-2.2	4.2	5.9	22.7	24.8	40.4	35.8	42.9	43.5	31.6	21.9
BOTTOMLAND SAGEBRUSH	7.2	3.1	26.3	30.1	-	44.1	40.6	-	4.2	1.8	-1.1	0.2	3.1	15.0	34.4	31.5	49.1	32.9	30.0	11.0	8.9
UPLAND SAGEBRUSH	0.1	3.5	13.6	20.5	42.3	46.3	47.3	45.3	-	1.0	-0.1	0.2	1.2	12.3	32.5	35.2	41.2	44.8	36.2	27.2	26.0

TABLE B-1-2

MEAN, MEAN MAXIMUM AND MEAN MINIMUM AMBIENT AIR TEMPERATURES, 1975-1976

MEAN MIN °C	1975 MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1976 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
PINYON JUNIPER WOODLAND	-10.8	-8.5	-3.0	2.5	6.9	7.2	3.3	0.1	-4.1	-5.6	-11.3	-8.8	-7.4	-3.1	0.8	5.6	5.0	10.1	10.2	4.5	5.0
CHAINED PINYON JUNIPER RANGE LAND	-10.3	-4.0	0.4	4.4	10.1	7.2	3.1	-1.2	-12.5	-9.5	-14.8	-8.8	-9.7	-3.4	-0.3	4.7	9.3	10.1	5.9	-0.8	-5.3
BOTTOMLAND SAGEBRUSH	-9.2	-7.3	-2.8	2.8	-	5.9	4.5	-	-8.2	-8.7	-14.5	-9.4	-9.9	-5.6	-3.5	1.6	6.8	-7.1	-20.5	-29.7	-34.3
UPLAND SAGEBRUSH	-5.2	-5.8	1.2	5.0	13.4	12.8	20.0	12.4	-	-10.8	-11.1	-6.6	-7.4	-2.9	0.5	4.8	5.9	8.9	5.5	-1.6	-2.9

MEAN MEAN °C	1975 MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1976 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
PINYON JUNIPER WOODLAND	-4.2	-2.9	3.5	10.1	15.0	16.4	10.3	7.8	2.4	-2.3	-6.7	-3.3	-2.2	2.9	6.7	13.2	15.2	17.9	19.4	12.6	12.2
CHAINED PINYON JUNIPER RANGE LAND	-2.6	1.3	8.0	13.1	19.4	17.0	11.7	8.1	-4.5	-2.1	-7.6	-2.6	-1.9	4.0	6.5	12.7	21.1	18.1	13.5	7.6	2.3
BOTTOMLAND SAGEBRUSH	-1.7	-1.6	5.6	11.0	-	16.3	14.2	-	0.5	-2.3	-5.8	-1.4	-0.7	4.5	6.8	12.5	18.6	5.4	-4.5	-22.0	-24.5
UPLAND SAGEBRUSH	-0.1	-1.0	7.5	12.0	20.6	21.7	27.6	20.6	10.0	-4.5	-6.0	-0.8	-1.5	3.7	6.4	13.6	15.4	16.1	12.2	5.4	3.2

MEAN MAX °C	1975 MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1976 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
PINYON JUNIPER WOODLAND	3.5	2.8	10.7	18.8	24.3	27.5	19.2	16.9	10.1	2.1	-0.2	3.8	4.4	9.9	14.0	22.3	26.8	28.0	29.7	20.2	17.1
CHAINED PINYON JUNIPER RANGE LAND	4.3	7.8	16.4	21.8	29.0	27.5	21.3	16.4	-2.3	3.5	-1.6	5.7	6.2	13.3	14.1	21.9	28.5	27.1	22.8	17.6	12.1
BOTTOMLAND SAGEBRUSH	7.0	5.4	15.4	20.2	-	28.2	26.6	-	11.0	7.9	3.6	9.5	9.1	15.0	16.5	22.4	29.7	19.8	8.0	-6.8	-7.6
UPLAND SAGEBRUSH	4.9	4.4	14.4	18.9	27.6	30.9	36.8	31.3	-	2.3	-0.8	5.6	4.9	10.3	14.4	20.7	22.9	24.5	19.8	12.6	10.6

TABLE B-1-3

TOTAL PRECIPITATION, 1975-1976

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
PINYON JUNIPER WOODLAND	1975			6.5	33.5	34.0	50.9	31.9	6.6	6.1	7.6	21.7	13.7
	1976	22.0	9.9	23.6	19.6	16.8	22.9	35.6	5.6	9.1	20.4	10.7	

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CHAINED PINYON JUNIPER RANGELAND	1975			18.5	6.4	18.2	32.8	45.5	4.3	4.8	4.3	7.1	12.9
	1976	22.0	14.1	33.0	7.5	14.5	-	-	-	-	15.9	8.6	

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
BOTTOMLAND SAGEBRUSH	1975			6.5	12.9	26.9	46.2	44.2	10.2	3.6	5.0	14.4	15.2
	1976	22.9	24.8	32.0	35.6	71.1	-	0.0	14.7	6.9	19.4	0.0	

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
UPLAND SAGEBRUSH	1975			7.9	6.5	26.2	31.5	34.9	4.1	11.9	4.6	12.7	11.5
	1976	41.3	46.0	92.2	49.0	63.0	16.3	16.3	0.0	46.7	19.9	1.1	

TABLE B-1-4

HIGHEST AND LOWEST MAXIMUMS AND MINIMUMS 1975-1976 FOR SURFACE AND AMBIENT LEVELS
(Monthly Values Shown in Parentheses)

	Mean Maximum		Mean Minimum		Mean Maximum		Mean Minimum	
1975	Highest	Lowest	Highest	Lowest	Highest	Lowest	Highest	Lowest
MAR	7.2(4)	-2.3(6)	-1.0(3)	-6.6(6)	7.0(4)	3.5(6)	-5.2(3)	-10.8(6)
APR	9.4(7)	1.5(6)	0.2(3,7)	-5.6(4)	7.8(7)	2.8(6)	-4.0(7)	- 8.5(6)
MAY	29.8(7)	13.6(3)	2.9(3)	-3.5(4)	16.4(7)	10.7(6)	1.2(3)	- 3.0(6)
JUN	33.6(7)	20.5(3)	6.8(3)	2.0(4)	21.8(7)	18.8(6)	5.0(3)	2.5(6)
JUL	44.8(6)	42.3(3)	12.6(3)	5.0(4)	29.0(7)	24.3(6)	13.4(3)	6.9(6)
AUG	49.0(6)	44.1(4)	10.1(3)	4.5(7)	30.9(3)	27.5(6,7)	12.8(3)	5.9(4)
SEP	47.3(3)	37.7(7)	16.1(3)	-0.2(7)	36.8(3)	19.2(6)	20.0(3)	3.3(6)
OCT	45.3(3)	27.1(7)	6.0(3)	-4.2(7)	31.3(3)	16.4(7)	12.4(3)	- 1.2(7)
NOV	15.3(6)	-0.7(7)	3.0(3)	-3.3(6)	11.0(4)	-2.3(7)	-4.1(6)	-12.5(7)
DEC	3.3(7)	-1.2(6)	-0.3(3)	-3.9(6)	7.9(4)	2.1(6)	-5.6(6)	-10.8(3)
1976								
JAN	-0.1(3)	-4.1(6)	-1.3(3)	-6.1(6)	3.6(4)	-1.6(7)	-11.1(3)	-14.8(7)
FEB	4.2(7)	0.2(3,4)	-1.7(3)	-7.0(7)	9.5(4)	3.8(6)	- 6.6(3)	- 9.4(4)
MAR	5.9(7)	-0.8(6)	+1.6(4)	-3.2(7)	9.1(4)	4.4(6)	- 7.4(3,6)	- 9.9(4)
APR	22.7(7)	12.3(3)	-0.6(3)	-5.9(7)	15.0(4)	9.9(6)	- 2.9(6)	- 5.6(4)
MAY	34.4(4)	24.8(7)	-0.3(6)	-2.2(4)	16.5(4)	14.0(6)	0.8(6)	- 3.5(4)
JUN	40.4(7)	31.5(4)	8.0(4)	3.7(6)	22.4(4)	20.7(3)	5.6(6)	1.6(4)
JUL	49.1(4)	35.8(7)	11.2(4)	4.1(6)	29.7(4)	22.9(3)	9.3(7)	5.0(6)
AUG	44.8(3)	32.9(4)	8.4(6)	-0.2(4)	28.0(6)	19.8(4)	10.1(6,7)	- 7.1(4)
SEP	48.1(6)	30.0(4)	9.7(6)	-5.3(4)	29.7(6)	8.0(4)	10.2(6)	-20.5(4)
OCT	36.3(6)	11.0(4)	1.8(6)	-10.4(4)	20.2(6)	-6.8(4)	4.5(6)	-29.7(4)
NOV	31.6(3)	- 8.9(4)	2.4(6)	-17.2(4)	17.1(6)	-7.6(4)	5.0(6)	-34.3(4)

TABLE B-1-5

MEAN SNOW DEPTH AND MEAN WATER CONTENT, 1975-1976

		SEASON	
		1974 / 1975	1975 / 1976
PINYON JUNIPER WOODLAND	Mean Water Content	3.4	4.9
	Mean Depth	15.2	19.0
CHAINED PINYON JUNIPER RANGELAND	Mean Water Content	2.7	4.5
	Mean Depth	11.8	17.9
BOTTOMLAND SAGEBRUSH	Mean Water Content	1.7	3.2
	Mean Depth	10.8	14.0
UPLAND SAGEBRUSH	Mean Water Content	4.7	8.9
	Mean Depth	22.1	30.7

TABLE B-1-6

MEAN WIND SPEED, 1975-1976

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
PINYON JUNIPER WOODLAND	1975			1.6	1.4	2.6	1.1	1.3	1.0	2.3	2.1	1.9	3.5
	1976	2.1	1.4	2.3	2.1	1.9	2.6	1.6	2.3	2.1	1.9	2.1	

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CHAINED PINYON JUNIPER RANGELAND	1975			3.7	3.5	3.5	3.2	2.4	2.4	2.1	3.2	5.5	2.3
	1976	3.2	2.4	3.1	3.7	3.1	3.7	3.1	3.2	2.4	1.8	1.4	

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
BOTTOMLAND SAGEBRUSH	1975			2.6	2.4	2.3	1.9	-	1.9	3.2	-	2.9	2.7
	1976	3.7	2.7	2.1	2.7	4.7	2.7	2.3	1.8	1.9	2.6	2.4	

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
UPLAND SAGEBRUSH	1975			8.1	9.3	9.0	7.1	6.9	6.6	9.0	8.2	8.9	9.3
	1976	6.6	8.2	9.3	9.7	7.7	8.5	6.9	8.7	8.4	5.6	5.6	

TABLE B-1-7
MEAN SOIL MOISTURE VALUES, 1975-1976

NO.	VEGETATION TYPE	VEG. #	1975 MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1976 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	CHAINED PINYON JUNIPER RANGELAND																							
1		1	32	40	15	28	18	14	12	12	15	30	32	32	31	30	28	24	13	14	-	-	-	-
2		2	11	31	16	22	14	11	10	10	17	24	29	35	34	30	21	15	11	13	-	-	-	-
7		7	28	28	-	27	16	21	17	-	18	20	22	21	28	28	26	25	19	17	-	-	-	-
	PINYON JUNIPER WOODLAND																							
5		5	15	34	12	20	11	10	8	9	11	-	26	31	31	25	17	15	8	11	-	-	-	-
6		6	-	31	14	26	23	18	16	15	17	21	17	18	27	25	23	20	17	17	-	-	-	-
14			13	30	13	22	16	14	13	12	14	15	14	13	14	27	22	17	14	14	-	-	-	-
15			16	-	14	26	16	10	11	11	15	20	25	22	31	32	25	23	14	20	-	-	-	-
	UPLAND SAGEBRUSH																							
3		3	17	32	16	30	21	17	15	16	16	20	21	19	29	20	31	25	17	19	-	-	-	-
16			-	-	14	26	19	14	13	12	14	16	16	16	18	32	28	26	15	14	-	-	-	-
	BOTTOMLAND SAGEBRUSH																							
4		4	13	26	13	24	16	12	10	11	14	16	15	13	18	23	23	20	13	12	-	-	-	-
9			9	17	8	14	9	8	6	-	10	11	10	9	10	16	17	11	8	11	-	-	-	-
12			10	18	10	19	14	10	10	10	13	-	13	11	11	14	16	14	10	10	-	-	-	-
	BUNCHGRASS																							
8			12	16	7	17	12	8	8	-	8	7	14	12	20	18	17	16	9	8	-	-	-	-
11			14	18	8	16	10	9	6	6	13	16	24	31	35	16	15	11	7	7	-	-	-	-
	RABBITBRUSH																							
10			14	-	-	14	10	10	10	9	12	14	14	12	26	24	22	16	10	10	-	-	-	-
	MIXED MOUNTAIN SHRUBLAND																							
13			18	10	12	21	18	15	13	23	16	17	17	17	16	20	22	20	15	8	-	-	-	-
	ANNUAL WEEDS																							
17			25	25	13	24	18	11	-	-	-	14	15	12	14	26	24	18	9	9	-	-	-	-

TABLE B-1-8

MEAN MONTHLY RELATIVE HUMIDITY, 1975-1976

			1975										1976											
NO.	VEGETATION TYPE	VEG. #	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	CHAINED PINYON JUNIPER RANGELAND	1	46	-	-	29	18	43	94	85	24	59	-	-	35	-	-	-	26	-	-	-	-	-
2		2	55	-	-	23	65	95	49	63	21	50	-	-	72	-	-	-	62	-	-	-	-	-
7		7	-	-	-	-	31	-	41	51	19	70	66	68	68	55	64	52	45	51	54	56	54	-
5	PINYON JUNIPER WOODLAND	5	33	-	-	-	28	46	76	91	23	70	-	-	-	-	100	-	30	-	-	-	-	-
6		6	-	-	24	-	35	91	43	59	20	57	-	-	39	-	-	-	39	-	-	-	-	-
14			45	-	-	-	31	34	75	63	25	73	-	-	32	-	-	-	16	-	-	-	-	-
15			59	-	-	-	55	94	50	64	23	73	-	-	40	-	-	-	28	-	-	-	-	-
3	UPLAND SAGEBRUSH	3	94	-	-	47	48	31	90	92	37	70	-	-	45	-	100	-	44	-	-	-	-	-
16			39	-	-	-	60	89	62	88	24	66	-	-	44	-	-	-	-	-	-	-	-	-
4	BOTTOMLAND SAGEBRUSH	4	32	-	-	32	69	96	32	77	36	42	-	-	49	-	-	-	44	-	-	-	-	-
9			-	-	26	-	55	91	37	77	26	59	-	-	28	-	-	-	42	-	-	-	-	-
12			27	-	26	-	29	89	34	81	19	42	-	-	30	-	-	-	34	-	-	-	-	-
8	BUNCHGRASS		-	-	31	-	52	98	33	51	20	32	-	-	41	-	21	-	88	-	-	-	-	-
11			-	-	27	-	34	89	47	69	20	55	-	-	36	-	26	-	31	-	-	-	-	-
10	RABBITBRUSH		-	-	-	-	69	87	44	82	37	39	-	-	28	-	26	-	36	-	-	-	-	-
13	MIXED MOUNTAIN SHRUBLAND		30	-	36	-	30	91	38	62	22	62	-	-	29	-	-	-	31	-	-	-	-	-
17	ANNUAL WEEDS		53	-	-	-	40	-	39	94	23	64	-	-	49	-	-	-	46	-	-	-	-	-

TABLE B-1-9 NET RADIATION VALUES, 1975-1976

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1975			-	-	-	-	0.81	1.12	0.63	0.53	0.35	0.41
1976	0.36	0.41	-	-	-	-	-	0.70	-	-	-	

TABLE B-1-10

ANALYSIS OF VARIANCE

UPLAND SAGEBRUSH, BOTTOMLAND SAGEBRUSH, AND PINYON-JUNIPER WOODLAND

LEVELS OF FACTORS
A 5 Parameters (Temperature: Ambient, Surface, Soil at -20 cm & -60 cm and Precip.)
B 13)
C 5) 65 observation by date
D 3 stations

GRAND MEAN 3.20477

SOURCE OF VARIATION	SUMS OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARES
A	3086.37451	4	771.59351
B	1361.46167	12	113.45514
AB	573.64331	48	11.95090
C	16001.9062	4	4000.47656
AC	4844.58203	16	302.78638
BC	12705.0273	48	264.68799
ABC	4906.42187	192	25.55428
D	616.37183	2	308.18579
AD	240.60751	8	30.07593
BD	403.76465	24	16.82352
ABD	387.10742	96	4.03237
CD	460.78394	8	57.59799
ACD	308.07520	32	9.62735
BCD	703.65259	96	7.32971
ABCD	1111.28052	384	2.89396
TOTAL	47711.0430	974	

TABLE B-1-11

ANALYSIS OF VARIANCE

UPLAND SAGEBRUSH, BOTTOMLAND SAGEBRUSH, PINYON-JUNIPER WOODLAND, CHAINED PINYON-JUNIPER RANGELAND

LEVELS OF FACTORS		
A	3	Parameters (Temperature: Ambient, Surface, Soil at -20 cm)
B	65	Observations by date
C	4	Stations

GRAND MEAN 3.79831

SOURCE OF VARIATION	SUMS OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARES
A	713.26733	2	356.63354
B	43225.1172	64	675.39233
AB	1880.79883	128	14.69374
C	491.56372	3	163.85457
AC	71.28781	6	11.88130
BC	2996.50122	192	15.60678
ABC	1362.40259	384	3.54792
TOTAL	50740.9297	779	

Table B-1-12 ANALYSIS OF VARIANCE
MONTHLY PRECIPITATION

Means for the Four Major Vegetation Types	
Chained Pinyon-Juniper Rangeland	- 18.9 mm
Pinyon-Juniper Woodland	- 20.7 mm
Upland Sagebrush	- 20.9 mm
Bottomland Sagebrush	- 19.3 mm

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares
Total	736979.3	87	
Groups	66.8	3	22.3
Error	736912.5	84	8772.8

B-1-13 MONTHLY MEAN PERCENT SOIL MOISTURE

Means for the Four Major Vegetation Types	
Chained Pinyon-Juniper Rangeland	- 21.5
Pinyon-Juniper Woodland	- 20.0
Upland Sagebrush	- 21.6
Bottomland Sagebrush	- 16.2

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares
Total	482524.0	71	
Groups	319.9	3	106.6
Error	482204.1	68	7091.2

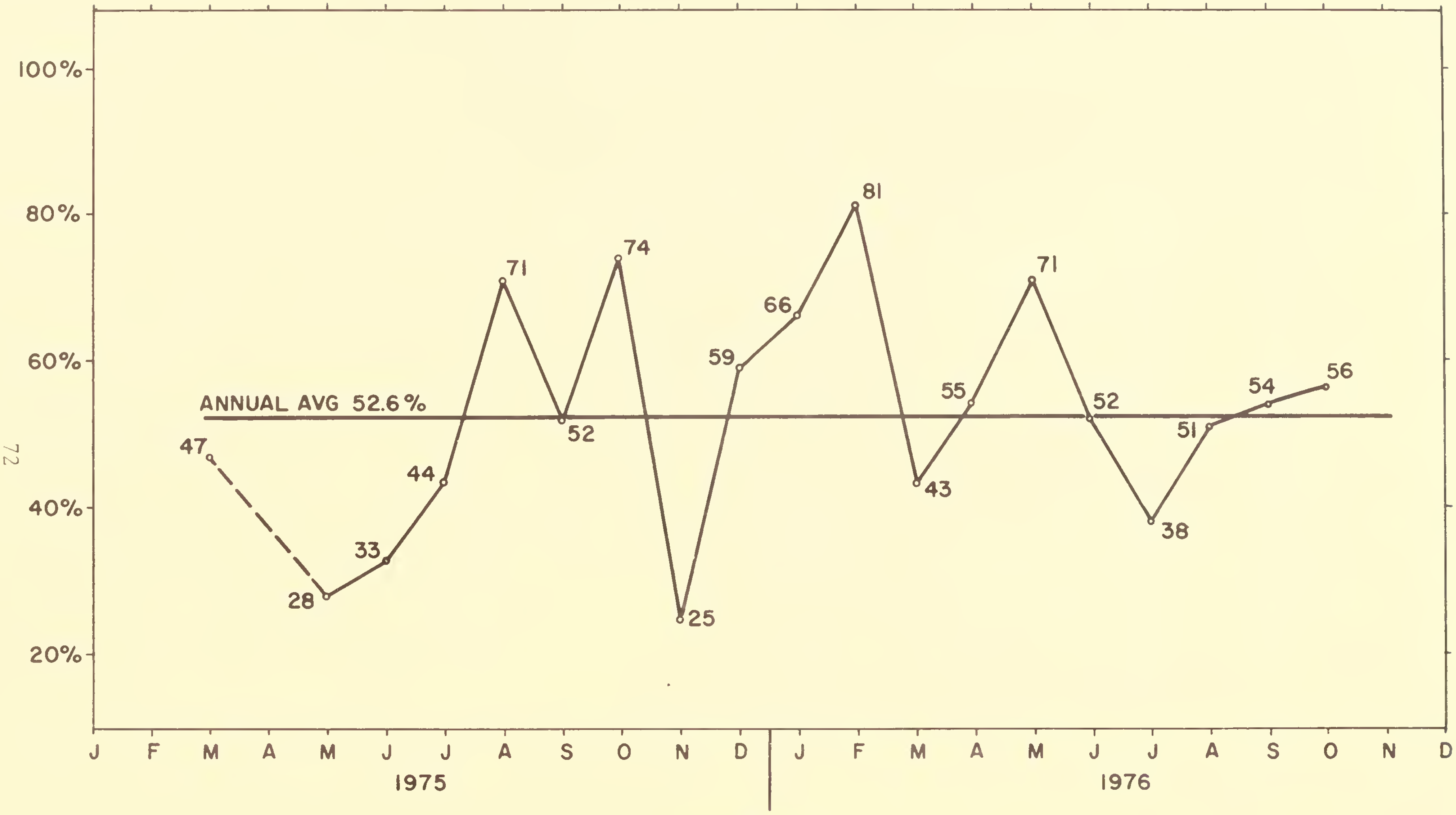

FIGURE B-1-1
RELATIVE HUMIDITY
AVERAGED OF MONTHLY OBSERVATIONS FOR THE
FOUR MAJOR VEGETATION TYPES 1975-1976

B.2 Soil Data

B.2.1 Soil Type Descriptions (prepared by the Soil Conservation Service)

B.2.1.1 Hagga Series

The Hagga series consists of deep, poorly, and very poorly drained soils that formed in alluvium derived mainly from calcareous sandstones and shales. Hagga soils are on valley bottoms and have slopes of 0 to 5 percent. The mean annual precipitation is about 16 inches and the mean annual air temperature is about 45 degrees F.

Hagga soils are similar to the Buford and Havre soils. Buford soils have dark surfaces and have very gravelly substratums. Havre soils are well drained to moderately well drained, lacking mottles above a depth of 40 inches.

Typical pedon of Hagga loam, 0 to 5 percent slopes, 150 feet south and 160 feet west of northwest corner of Section 5, T. 3S, R. 96W (175 feet southwest of Stewart Gulch gauging station).

B.2.1.1.1 Hagga Loam, 0 to 5 Percent Slopes

This is a very deep, poorly drained soil on floodplains at elevations of 6,000 to 6,700 feet. It formed in calcareous alluvium from mixed sandstone and shale sources. The average annual precipitation is about 16 inches, average annual air temperature is about 45 degrees F., and average frost-free period is about 80 to 95 days.

Included in this unit are small areas of Havre soils. Also included are areas of somewhat poorly drained soils which have seasonal water tables at depths between 40 and 54 inches. Small areas of very poorly drained Hagga soils and poorly and very poorly drained clayey soils are included. Included areas of very poorly drained soils and of strongly saline loams and clay loams are shown on the soil maps by symbols which indicate those spots. All included soils are very deep and have slopes of between 0 and 5 percent.

Typically, the surface layer is loam about 25 inches thick, and except for a dark lens, is light gray. This is underlain at a depth of 25 inches by light gray clay loam. Rust colored iron mottles are common throughout the soil.

Permeability is moderately slow. Effective rooting depth is 60 inches or more. Available water-holding capacity is high. Organic matter content in the surface layer is medium. Surface runoff is slow, with some ponding. Erosion hazard is slight.

0	2-0" -	Organic material comprised of grasses, sedges, and rushes in various stages of decomposition.
A11	0-5" -	Light gray (10YR 7/2) loam, pale brown (10YR 6/3) moist; common, fine, and medium, faint, light yellowish brown (10YR 6/4) iron mottles; weak medium granular structure; slightly hard, very friable, nonsticky and nonplastic; strongly calcareous; clear smooth boundary.
A12	5-12" -	Light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; common, fine, and medium, faint, light yellowish brown (10YR 6/4) iron mottles; weak coarse platy and weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; strongly calcareous; clear smooth boundary.
A13gb	12-17" -	Dark gray (10YR 4/1) loam; black (10YR 2/1) moist; massive; slightly hard, friable nonsticky and nonplastic; weakly calcareous; clear smooth boundary.
C1gb	17-25" -	Light gray (10YR 7/1) loam, dark grayish brown (10YR 4/2) moist; common fine faint, light yellowish brown mottles; massive; hard, friable, nonsticky and nonplastic; weakly calcareous; gradual wavy boundary.
C12gb	25-50" -	Light gray (2.5YR 7/2) clay loam, gray (10YR 5/1) moist; many fine, and medium distinct, light brown iron mottles; massive; hard, friable, sticky and plastic; weakly calcareous.

These soils have a water table which fluctuates, being highest in late spring or early summer.

The A horizon has a value for lightness of six or seven dry and four to six moist. Chromas are two or less and hue is 10YR. This horizon ranges from very fine sandy loam to light clay loam. The C horizons have hues of 10YR and 215Y, and below depths of 40 inches may range to 5Y; chromas are two or less. Mottles have chromas of three or more, in hues of 7.5YR and 10YR.

This soil is used for native and seeded grass hay. Limited acreage is seeded to small grain for hay. Yields of the more desirable grasses and small grains are medium, being limited by the high water table.

In the fall local ducks utilize the grasses on Hagga soils; however, they find most of the seeds on included areas of very poorly drained soils which are too wet to mow for hay. In evenings deer concentrate on Hagga soil for the water which is associated with it.

Hagga soils have a poor potential for urban and recreational developments. High water tables are the chief limiting feature. The prevalent surface ponding leads to a mosquito problem on this soil.

Problems will arise with septic tank absorption fields because of the high water table. Experience with deep borings are too limited to be suggestive as to whether vertical leach lines would be feasible. (Capability Subclass IVw, Irrigated.)

B.2.1.2 Glendive Series - 41

The Glendive series consists of deep, well drained soils formed in alluvial materials. Glendive soils are in valley positions and have slopes of 2 to 9 percent. Mean annual precipitation is about 14 inches and mean annual air temperature is about 43 degrees F.

Glendive soils are near the Hagga, Havre, and Hanly soils. Hagga soils are poorly drained. Hanly soils have a sandy control section. Havre soils are finer textured than the Glendive soils.

Typical pedon of Glendive fine sandy loam, 2 to 9 percent slopes, about 100 yards south of the Ryan Gulch Road and 50 feet east of the fence in the NE¼ NE¼ Section 12, T.2S, R. 98W.

B.2.1.2.1 Glendive Fine Sandy Loam, 2 to 15 Percent Slopes

This is a deep, well drained soil on valley bottoms at 5,900 to 7,600 feet. It formed in mixed alluvial materials mainly derived from sedimentary rocks. The average annual precipitation is 14 to 18 inches, average annual air temperature is about 43 degrees F, and average frost-free period is 80 to 105 days.

Typically, the surface layer is a pale brown fine sandy loam about 12 inches thick. The substratum is stratified loams, sandy loams, and loamy sands to a depth of over 60 inches.

Included in this unit are small areas of Hanly gravelly loamy fine sand, Havre loam, and Hagga loam, all having slopes of 2 to 9 percent.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Organic matter content in the surface is medium. Surface runoff is slow and erosion hazard slight.

This soil is used for irrigated pasture, livestock grazing, and wildlife habitat.

Rare flooding would limit the use of Glendive soils for community development and sanitary facilities. This soil is a good source for road fill material. Rare flooding will limit the use of this soil for intensive recreational areas. (Capability Unit, III3; Range Site, Foothill Swale.)

A1	0-12" -	Pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; moderate coarse platy parting to weak fine granular structure; soft, friable, slightly sticky, slightly plastic; moderately alkaline (pH 8.2); clear wavy boundary.
C1	12-39" -	Pale brown (10YR 6/3) stratified loam and sandy loam, brown (10YR 4/3) moist; weak to medium moderate subangular blocky structure parting to weak to medium fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; strongly alkaline (pH 8.8); clear wavy boundary.
C2	39-78" -	Highly stratified loams, sandy loams, and loamy sands; strongly alkaline (pH 8.6).

Coarse fragments, one-fourth to three-fourths inch in diameter, make up 5 to 30 percent of the solum. Reaction ranges from moderately to strongly alkaline.

The thickness of the strata vary with the past intensity of storms.

B.2.1.3 Rentsac Series - 63

The Rentsac series consists of shallow, well drained soils formed in residuum from sandstone. Rentsac soils are on foothills (upland entrenched terrace) and have slopes which are 5 to 50 percent. Mean annual precipitation is 16 inches and the mean annual air temperature is about 44 degrees F.

Rentsac soils are similar to the Redcreek soils. Redcreek soil is non-skeletal, while Rentsac is skeletal.

Typical pedon of Rentsac very channery sandy loam, 5 to 50 percent slopes, under chained pinyon-juniper area, NE¼ SW¼, Section 27, Township 1 North, Range 98 West.

B.2.1.3.1 Rentsac Very Channery Fine Sandy Loam, 5 to 50 Percent Slopes

This is a shallow, well drained soil on foothills and ridge tops at elevations of 6,000 to 6,600 feet. It formed in residuum on sandstone that is usually horizontally fractured. The average annual precipitation is about 16 inches, average annual air temperature is about 44 degrees F, and frost-free period is about 80 to 105 days.

Typically, the surface layer is a pale brown very channery sandy loam, about 4 inches thick. The underlying layer is a pale brown very channery sandy loam, about 7 inches thick. The substrata is a pale brown very flaggy sandy loam, about 7 inches thick and overlies fractured hard sandstone.

The Rentsac soil comprises about 70 percent of the map unit. The remaining percentage is comprised of inclusions of Rock outcrop, Redcreek soils, Yamac soils in narrow areas too small to delineate, Piceance soils, and soils similar to Rentsac that are less than 10 inches to bedrock. A few small areas have slopes steeper than 50 percent.

Permeability is rapid. Effective rooting depth is less than 20 inches. Organic matter content in the surface layer is medium. Available water capacity is low. Surface runoff is medium and erosion hazard is slight to moderate.

A11 0-2" - Pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, nonplastic, nonsticky; calcareous, mildly alkaline, (pH 7.8); clear smooth boundary.

A12 2-6" - Pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure parting to weak fine granules; soft, very friable, nonplastic, nonsticky; strongly calcareous, moderately alkaline (pH 8.2); clear wavy boundary.

C 6-11" - Very pale brown (10YR 7/3) fine channery sandy loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable, nonplastic, nonsticky; strongly calcareous, moderately alkaline (pH 8.2); abrupt smooth boundary.

Cr 11-19" - Very pale brown (10YR 7/4) sandy loam, light yellowish brown (10YR 6/4) moist; massive; slightly hard, very friable; strongly calcareous; moderately alkaline (pH 8.2).

R 19"+ - Hard sandstone.

Thickness of the solum ranges from 10 to 20 inches. Coarse fragments make up 5 to 20 percent of the solum. Reaction is mildly alkaline to moderately alkaline.

A1 0-4" - Pale brown (10YR 6/3) very channery sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky and slightly plastic; 40 percent sandstone channery; calcareous, moderately alkaline (pH 8.4); clear boundary.

Ac 4-11" - Pale brown (10YR 6/3) very channery sandy loam, dark grayish brown (10YR 4/2) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic, 50 percent channery and 10 percent flags; calcareous, moderately alkaline (pH 8.4); clear smooth boundary.

Cr 11-18" - Pale brown (10YR 6/3) very flaggy sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; 65 percent flags and 15 percent sandstone; channery; calcareous, moderately alkaline (pH 8.4); clear smooth boundary.

R 18" - Hard fractured sandstone.

The A horizon ranges from very channery or flaggy sandy loam to very channery or flaggy loam. Coarse fragment ranges from 25 to 40 percent total, most of which is 3 inches. The depth to bedrock ranges 10 to 20 inches. The underside and along cracks of the coarse fragments in Ac and Cr have lime coatings. The 10 to 20 inch section has a clay range of 10 to 25 percent.

The Ac has 60 percent coarse fragment with 10 percent 3 inches.

The Cr has 80 percent total coarse fragment with 15 percent channery fragments and 65 percent flags.

Reaction is moderately alkaline throughout.

This soil is used for livestock grazing and recreation.

This soil has a severe limitation on sanitary facility uses due mainly to the depth to rock and slope. (This includes sewage lagoons, septic tank absorption fields, and landfills.) Local roads and streets have a severe limitation for the same reason. As source materials, such as roadfill and topsoil, Rentsac is poor due to thin layer, small stones, and problems of area reclaim. (Capability Unit; VIIs: Range Site; Grazeable Woodland, Stony Foothills.)

B.2.1.4 Redcreek Series

The Redcreek series consists of shallow, well drained soils that formed in sandy material weathered from underlying calcareous sandstone. Redcreek soils are on mountain sideslopes and ridges and have slopes of 5 to 30 percent. Mean annual precipitation is about 16 inches and the mean annual air temperature is about 44 degrees F.

Redcreek soils are similar to the Rentsac soils. Rentsac soils are skeletal and are on fractured sandstone, while Redcreek soils are non-skeletal and are on massive sandstone.

Typical pedon of Redcreek sandy loam, 5 to 30 percent slopes, about 900 feet N of SW¼ corner, Section 18, T. 3S, R. 96W.

B.2.1.4.1 66-Redcreek-Rentsac Complex, 5 to 30 Percent Slopes

These moderately sloping to steep soils are formed in residuum on foothill slopes and ridges at elevations of 6,000 to 7,600 feet. Average annual precipitation is about 16 inches, and the mean annual air temperature is about 44 degrees F. The Redcreek soil makes up about 60 percent of the mapping unit, and the Rentsac soil makes up about 30 percent. Redcreek soil is similar to the Rentsac soil but differs in being non-skeletal. About 10 percent of the unit is Rock Outcrop, Piceance fine sandy loam, and Yamac loam.

The Redcreek soil is a shallow, well drained soil that formed in residuum from massive sandstone that weathers rapidly.

Typically, the surface layer is a pale brown sandy loam, about 6 inches thick. The substratum is a fine channery sandy loam, about 12 inches thick, and rests on massive sandstone.

Permeability is moderately rapid. The effective rooting depth is 10 to 20 inches, and the available water capacity is low.

Surface runoff is slow, and the erosion hazard is slight.

The Rentsac soil is a shallow, well drained soil that formed in residuum from sandstone which is highly fractured and hard.

Typically, the surface layer is a pale brown very channery sandy loam, about 4 inches thick. The underlying layer is a pale brown very channery sandy loam, about 7 inches thick.

A1	0-4" -	Brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) moist; moderate medium granular structure; soft, friable, slightly sticky, slightly plastic; many fine and very fine roots; non-calcareous, mildly alkaline (pH 7.4); clear wavy boundary.

B1 4-10" - Brown (10YR 5/3) very fine sandy loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many fine and very fine roots; non-calcareous, mildly alkaline (pH 7.5); clear wavy boundary.

B2 10-22" - Light yellowish brown (10YR 6/4) loams, yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; calcareous, mildly alkaline (pH 7.6); clear wavy boundary.

Cca 22-37" - Very pale brown (10YR 7/3) extremely channery sandy loam, pale brown (10YR 6/3) moist; massive; slightly hard, friable, nonsticky, nonplastic; some visible calcium carbonate as concretions; strongly calcareous, strongly alkaline (pH 8.6); clear wavy boundary.

The substratum is a pale brown very flaggy sandy loam, about 7 inches thick, and rests on hard fractured sandstone.

Permeability is rapid. Effective rooting depth is 10 to 20 inches, and available water capacity is low. Surface runoff is slow and erosion hazard slight.

These soils are used for limited livestock grazing and wildlife habitat.

These soils have limited use for community development, sanitary facilities, and recreation areas due to steep slopes and depth to bedrock.

The thin layers of soils make this soil unsuited for use as topsoil and source material for roadfill. (Capability Unit, VIe; Woodland Site; Pinyon-Juniper, Range Site; Stony Foothills.)

B.2.1.5 Piceance Series - 70

The Piceance series consists of moderately deep, well drained soils that formed in residuum from sandstone and modified with aeolian material. Piceance soils are on upland slopes and ridges and have slopes of 5 to 15 percent. Mean annual precipitation is about 14 to 18 inches and the mean annual air temperature is about 43 degrees F.

Piceance soils are similar to Forelle, Yamac, and Kinnear. Forelle, Yamac, and Kinnear soils are deep and do not have bedrock above 40 inches. Kinnear soils occur in a warmer temperature zone.

Typical pedon of Piceance fine sandy loam, 5 to 25 percent, NE¼, NE¼, Section 33, T. 2S, R. 99W.

B.2.1.5.1 Piceance Fine Sandy Loam, 5 to 15 Percent

This is a moderately deep, well drained soil on upland slopes and ridges at elevations of 6,500 to 7,500 feet. It formed in residuum from sandstone and modified with aeolian material. The average annual precipitation is about 15 to 17 inches; average annual air temperature is about 43 degrees F., and average frost-free period is about 80 to 105 days.

Typically, the surface layer is brown, fine sandy loam about 10 inches thick. The subsoil is light, yellowish brown loam about 12 inches thick. The substratum is very pale brown, very channery sandy loam about 15 inches thick and overlies hard sandstone. There is a layer of strong lime accumulation in the lower part of the subsoil and substratum.

Included in this unit are small areas of Yamac loam, Forelle loam, and Redcreek-Rentsac complex, all having slopes of 5 to 15 percent. Also, included in this unit are small areas of soils which have darker surface layers, which occur at upper elevations of this unit.

Permeability is moderately rapid. Effective rooting depth is 20 to 40 inches. Available water capacity is moderate. Organic matter content in the surface is medium. Surface runoff is slow to medium and erosion hazard slight to moderate.

This soil is for livestock grazing, wildlife habitat, and limited recreation.

This soil has moderate to severe limitations for community development and sanitary facilities due to depth to bedrock. Recreational areas have slight to moderate limitations due to dustiness and depth to rock. This soil is a fair to poor source for topsoil and roadfill material due to depth to rock and borrow area reclamation. (Capability Unit, VI3; Range Site, Rolling Loam.)

B.2.1.6 Forelle Series - 71

The Forelle series consists of deep, well drained soils that formed in calcareous aeolian sediments. Forelle soils are on uplands and terrace slopes and have slopes of 3 to 15 percent. Mean annual precipitation is about 14 to 18 inches and mean annual air temperature is about 42 degrees F.

Forelle soils are similar to the Piceance and Yamac soils. Piceance soils have a lithic contact less than 40 inches. Yamac soils do not have an argillic horizon.

Typical pedon of Forelle loam, 3 to 25 percent slopes, about 0.3 mile east and 0.2 mile south of the northwest corner of Section 30, T. 1N, R. 93W.

B.2.1.6.1 71C - Forelle Loam, 3 to 8 Percent Slopes

This is a deep, well drained soil on uplands and terrace slopes at elevations of 6,000 to 7,200 feet. It formed in fine textured aeolian deposits. The average annual precipitation is 14 to 18 inches, average annual air temperature is 42 degrees F., and average frost-free period is 80 to 105 days.

Typically, the surface layer is a brown loam about 4 inches thick. The subsoil is a brown, light, clay loam about 12 inches thick. The substratum is a very pale, brown loam extending to over 60 inches. There is a layer of strong lime accumulation in the lower subsoil and substratum.

Included in this unit are small areas of Yamac loam and Piceance fine sandy loam, both having slopes of 3 to 8 percent.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is medium. Surface runoff is slow and erosion hazard slight.

This soil is used for dryland farming, livestock grazing, and wildlife habitat.

The Forelle soils are well suited for community development, sanitary facilities, and recreational areas. This soil is a good source for topsoil and is fair for roadfill material. (Capability Unit, VIe; Range Site, Rolling Loam.)

A1	0-4" -	Brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate, fine granular structure, soft very friable; noncalcareous; mildly alkaline; clear, smooth boundary.

B2t 4-16" - Brown (7.5YR 5/4) light clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocks; hard, friable; few thin clay films on ped faces; noncalcareous; mildly alkaline; clear smooth boundary.

B3ca 16-19" - Pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; slightly hard, friable; calcareous; some visible secondary calcium carbonate occuring as lime seams and concretions; moderately alkaline; clear smooth boundary.

Cca 19-60" - Very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; massive structure; slightly hard, friable; calcareous; some visible secondary calcium carbonate occuring as lime seams and concretions; moderately alkaline.

The A horizon ranges between silt loam, loam, or very fine sandy loam textures. The B horizon ranges from loam to silty clay loam in texture. Depth to the strong calcium carbonate zone ranges from 12 to 20 inches. Rock fragments are usually less than 5 percent but ranges from 0 to 15 percent.

Reaction ranges from mildly alkaline in the surface to moderately alkaline in the substratum.

B.2.1.7 Rivra Series - 75

The Rivra series consists of deep, somewhat excessively drained soils that have formed in detrital alluvium of calcareous sandstone and shale origin. Rivra soils are on alluvial fans and in narrow valleys with slope gradients of 2 to 9 percent. Mean annual precipitation is about 16 inches and the mean annual air temperature is about 45 degrees F.

Rivra soils are similar to the Glendive soils with which they are closely associated. Glendive soils differ in being mainly sandy loam at 10 to 40 inch depth.

Typical pedon of Rivra gravelly loamy fine sand, 2 to 9 percent slopes, 1.5 miles up Ryan Gulch, 200 feet north of road, in the SE¼ of SE¼ Section 31, T. 1S, R. 98W.

B.2.1.7.1 Rivra Channery Loamy Fine Sand, 2 to 9 Percent Slopes

This is a very deep, somewhat excessively drained soil on alluvial fans and alluvial cones and on narrow stream bottoms at elevations between 6,000 and 6,500 feet. It formed in coarse alluvium of sandstone or mixed sandstone and shale origin. The average annual precipitation is about 16 inches, average annual air temperature is about 45 degrees F., and average frost-free period is about 80 to 105 days.

Included in this unit are small areas of Glendive soils, and areas of a soil differing from Rivra in being very channery in the 10 to 40 inch depth.

Typically, the surface layer is pale brown channery loamy fine sand about 6 inches thick. The next layers, to a depth of 37 inches, consist of light yellowish brown channery sand. The substratum, between 37 and 60 inches, consists of pale brown and light yellowish brown channery sand, very channery sand, and channery loamy fine sand. The soil is highly calcareous throughout.

Permeability is rapid. Effective rooting depth is 60 inches or more. Available water-holding capacity is low. Organic matter content in the surface is low. Surface runoff is slow and erosion hazard is medium.

This soil is used almost entirely for range. Small areas have been worked as a source of road metal.

The Rivra soil has a fair potential for cottontail and deer. They use grasses, forbs, and brush, and obtain their shelter primarily from the brush.

As roads are improved in the area, more of this soil will be used as a source of road material. Typically, the top layer has less gravel and in areas which are mined for road material, this top portion should be put aside, rather than mixed in with the more gravelly layers. If domestic water wells are put on these soils, care should be taken that sewage effluent does not leach into the water-bearing strata. (Capability subclass, VIe, dryland.)

A1 0-6" - Pale brown (10YR 6/3) channery loamy fine sand, brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; moderately alkaline, strongly calcareous; 18 percent fine channery; clear wavy boundary.

C1	6-16" -	Light yellowish brown (10YR 6/4) channery sand, dark yellowish brown (10YR 4/4) moist, massive; soft, very friable, nonsticky and nonplastic; moderately alkaline, violently calcareous; 17 percent fine channery; clear wavy boundary.
C2	16-21" -	Light yellowish brown (10YR 6/4) channery sand, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; moderately alkaline, violently calcareous, 50 percent channery, of which two-thirds is coarse; 5 percent cobble; clear wavy boundary.
C3	21-37" -	Light yellowish brown (10YR 6/4) channery sand; dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; strongly alkaline, violently calcareous; 33 percent channery, of which one-half is coarse; abrubt wavy boundary.
A1b	37-42" -	Pale brown (10YR 6/3) channery loamy fine sand, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; strongly alkaline (pH 9.0); violently calcareous; 20 percent fine channery; abrupt wavy boundary.
IIc1	42-50" -	Light yellowish brown (10YR 6/4) channery sand, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; strongly alkaline (pH 8.6); violently calcareous; 33 percent fine channery; clear wavy boundary.
IIc2	50-60" -	Light yellowish brown (10YR 6/4) channery sand, dark yellowish brown (10YR 4/4) moist, massive, loose, very friable, nonsticky and nonplastic; strongly alkaline, violently calcareous; 40 percent fine channery; clear wavy boundary.

The soil is 60 inches or more deep. Coarse fragments make up 25 to 35 percent of the 10 to 40 inch depth. Reaction is moderately alkaline.

The A horizon is light brownish gray or pale brown. The texture is variable, ranging from fine sandy loam to sand, and may be modified as channery.

The control section (10 to 40 inch depth) averages as channery sand, and is comprised of lenses which range from coarse sand to loamy fine sand, and which range from nearly channery free to extremely channery. Color is pale brown, light yellowish brown, or very pale brown. Reaction is mildly alkaline to strongly alkaline and is strongly or very strongly calcareous. Below the 40 inch depth the soil is generally similar, but may average very channery. Some soils contain thin buried dark colored A horizons.

B.2.2 Significant Soil Characteristics

The following is a brief discussion of soil characteristics:

Selenium. This trace element appears to stimulate growth in some species but is toxic at high levels.

Fluoride. This element acts as a respiratory inhibitor at high concentrations.

Calcium. Calcium is one of the essential plant nutrients. It is vital for the nitrification process. Calcium is also necessary for bud development. High calcium concentrations may interfere with boron metabolism (see Boron).

Magnesium. Magnesium is another of the essential plant nutrients. Magnesium is necessary to the synthesis of chlorophyll.

Potassium. Potassium is an essential nutrient that increases plant vigor and resistance to disease. Potassium also counteracts the effects of too much nitrogen (see Nitrogen). This element aids in the synthesis of starch and the movement of sugar through the plant.

Sodium. (See Exchangeable Sodium Percentage)

Zinc, Iron, Manganese, Copper, and Boron. Small amounts of these elements are essential to plants. Although necessary to the overall nutrient regime, all can become toxic to plant growth at high levels. Iron, at high concentrations, interferes with phosphate availability. Manganese also inhibits phosphorus availability, especially in acidic soils.

Phosphorus. Phosphorus is another of the essential major nutrient elements. Phosphorus is doubly important because it influences the absorption of other nutrients by plants. This element is also important to cell division, to the conversion of starch to sugar and to the flowering process.

Sulfur (Sulfate). Sulfur as sulfate is an essential major nutrient element and protein constituent. It is also important in molecules which are involved in cellular respiration.

Nitrogen (Nitrate). Nitrogen as nitrate is essential to plants in the formation of organic components such as proteins, chlorophyll, and coenzymes. Nitrogen governs the utilization by plants of such elements as potassium and phosphorus. In high concentrations nitrogen has detrimental effects on plants, such as decreased resistance to disease, retardation of flowering and poor root development. These effects, however, do not occur equally in all plants.

Ammonium Nitrate. This compound is a source of nitrogen both as NH and NO^-.

Chloride. This element is responsible for the stimulation of photosynthesis.

Molybdenum. This trace element is essential to nitrogen-fixation but is toxic in large amounts.

Cobalt. Cobalt is a necessary element in the nutrition of blue-green algae and is required by certain legumes for the fixation of nitrogen.

Texture. Soil texture is evaluated as light, medium, or heavy. Light soils are those in which the association of fine particles is loose, resulting in good aeration, adequate water movement, and suitable soil/root interfacing which increases cation-exchange. Light soils, however, are subject to erosion. A heavy soil restricts the movement of air and water and may decrease cation-exchange. Heavy soils tend to be acidic; light soils are more basic (Brady 1974).

Organic Matter. The presence of organic matter increases the ability of the soil to retain moisture and provides, to some degree, direct nutrition to plants. The amounts of available nutrition in organic matter, however, are not great. Not all organic matter is beneficial. Some toxic organic substances may be present and have deleterious effects in soils that are not well-drained (i.e., soils with heavy texture).

Lime. Lime decreases acidity and improves the texture of the soil. At very high levels, however, lime concentrations may interfere with calcium and boron metabolism and decrease the availability of phosphorus to plants.

pH. The availability of certain elements to plants is directly related to pH. At high pH levels, phosphorus availability is reduced. The pH has similar effects on boron and other trace elements such as iron, zinc, and manganese. Very high pH values decrease magnesium and calcium availability. Bacteria and actinomycetes function best at pH values between 6.0 and 7.0, but are not seriously impeded at excessive pH. Fungi do not respond directly to pH values. Nitrate availability correlates directly with micro-organism activity.

Cation-exchange Capacity. Exchangeable soil constituents - cations (such as hydrogen, calcium, potassium, and sodium) are necessary for plant growth. Cation-exchange occurs between the plant root and clay fraction of the soil. Cation-exchange capacity relates fairly directly to soil fertility.

Exchangeable Sodium Percentage. Sodium is considered a secondary or micro-nutrient element. In small amounts it is known to increase yields by replacing the action of potassium. In large concentrations, however, sodium is toxic to plants, causing cell plasmolysis (shrinking of protoplasm by dehydration).

Electrical Conductivity of Saturated Soil. Electrical conductivity is a measure of the amount of soluble salts in the soil. When excessive, soluble salts may cause plant toxicity.

Estimated Nitrogen Available to Plants One Year After Decomposition of Organic Matter. This is a projected estimate of nitrogen availability (see Nitrogen).

Arsenic. In high concentrations this element inhibits metabolic processes in living tissue.

B.2.3 Other Soil Data

Tables:

B-2-1 Chemical and Physical Analyses of Soil Samples Collected on Tract C-b (SCS Soil Sampling Locations)

B-2-2 Characteristics of Additional Soil Samples Taken on Tract C-b (C-b Staff Samples)

B-2-3 Herb Frequency Values

B-2-4 Shrub Importance Values

B-2-5 Listing of Sampling Sites

B-2-6 Summary of Significant Correlation Coefficients and T-Values for Shrub Importance Values

B-2-7 Summary of Significant Coefficients of Correlation and T-Values for Herb Frequency

B-2-8 Summary of Significant Correlation Coefficients and T-Values for Soil Characteristics

B-2-9 Typical Computer Output for Correlation and Regression Analysis

TABLE B-2-1

CHEMICAL AND PHYSICAL ANALYSES OF SOIL SAMPLES COLLECTED ON TRACT C-b
(SCS Soil Sampling Locations)

DRILL HOLE NUMBER AND INTERVAL		% OM	PERCENT LIME	OMN (6)	pH (1)	SALT EC. (4)	CEC (2)	ESP (3)	SAR (5)	GYP.	Fld Cap (7)	WILT pt. (8)	SATURATED SOIL EXTRACT meq./liter									
													Ca	Mg	Na	K	TOTAL CATIONS	SO4	Cl	CO3	HCO3	TOTAL ANIONS
1	0 - 6"	1.9	8.1	85.5	8.7	8.7	17.1	10.0	16.9	0.1	18.4	6.5	10.2	16.2	61.5	3.7	91.6	70.[illegible]	4.4	0.0	16.1	91.[illegible]
1	6"-16"	3.7	8.5	120.0	8.6	4.4	26.3	13.0	11.9	-0.1	35.2	21.7	5.1	8.2	30.8	1.9	46.0	27.6	2.3	0.0	15.5	45.4
1	16"-31"	1.2	6.3	54.0	8.4	4.4	18.9	2.1	12.2	-0.1	16.8	7.4	5.3	7.8	31.4	1.9	46.4	8.4	5.6	0.0	31.8	45.8
1	31"-60"	1.3	6.3	58.5	8.5	2.7	14.9	0.3	4.2	-0.1	16.3	6.7	12.7	2.8	11.6	1.3	28.1	3.4	0.9	0.0	23.7	28.0
2	0 - 7"	1.9	1.5	76.0	8.2	1.4	22.5	0.4	2.6	0.1	31.7	16.2	7.2	1.6	5.4	0.5	14.7	1.7	0.6	0.0	12.2	14.5
2	7"-11"	0.9	8.7	36.0	8.4	1.0	20.0	0.8	2.2	-0.1	32.1	19.0	5.1	1.0	3.8	0.4	10.0	0.3	0.3	0.0	9.6	10.2
2	11"-17"	1.3	5.4	58.5	8.3	1.6	15.9	0.3	2.8	-0.1	18.5	6.9	8.4	1.8	6.3	0.6	17.1	0.9	0.8	0.0	15.1	16.9
2	17"-28"	1.0	6.7	45.0	8.4	1.6	17.6	0.9	2.7	0.1	16.4	7.6	8.1	2.0	6.1	0.6	16.8	1.2	0.[illegible]	0.0	14.6	16.6
2	28"-50"	-	4.5	-	6.6	6.4	25.3	7.5	11.8	0.1	25.3	15.1	9.2	15.4	41.5	1.1	67.3	45.9	0.6	0.0	19.9	66.[illegible]
3	0 - 1"	2.1	8.4	84.0	8.3	2.7	23.1	5.1	4.2	0.1	31.2	23.3	12.2	3.6	11.9	1.0	28.7	13.5	1.3	0.0	13.5	28.3
3	1"-8"	2.0	2.0	80.0	8.2	1.5	16.5	0.5	2.6	0.1	27.1	17.9	7.2	2.2	5.7	0.6	15.6	1.9	0.8	0.0	12.7	15.4
3	8"-15"	1.5	8.7	60.0	8.7	2.7	24.7	28.0	4.4	0.1	32.4	18.1	11.6	3.5	12.1	0.9	28.2	1.8	1.8	0.0	24.1	27.8
4	0 - 2"	1.6	8.8	64.0	8.4	1.3	22.6	1.8	2.6	-0.1	33.0	20.6	6.2	2.1	5.2	0.7	14.1	0.5	0.4	0.0	13.0	13.9
4	2"-6"	0.6	8.9	27.0	8.6	7.9	20.6	27.2	3.4	0.1	17.8	7.3	53.9	8.3	19.2	2.0	83.5	5.5	5.3	0.0	71.6	82.5
4	6"-14"	2.3	1.9	92.0	8.1	4.3	17.1	0.8	1.4	-0.1	30.8	19.5	33.3	5.0	5.9	1.2	45.4	2.3	2.6	0.0	39.8	44.8
4	14"-21"	1.8	1.1	72.0	7.9	2.8	19.6	0.4	1.7	-0.1	34.6	21.8	19.9	3.1	5.8	0.7	29.4	1.3	1.3	0.0	26.2	29.0
4	21"-43"	0.3	1.7	36.0	8.3	3.2	18.3	0.9	2.2	0.1	15.5	7.0	21.6	3.3	7.6	0.8	33.3	1.4	1.2	0.0	30.2	32.8
4	43"-62"	1.3	7.4	52.0	8.4	5.0	20.5	4.5	2.7	-0.1	30.4	21.5	33.6	5.3	12.1	1.3	52.1	2.2	2.5	0.0	46.6	51.4
5	0 - 8"	1.4	3.4	56.0	6.[illegible]	1.8	23.0	0.2	4.5	-0.1	34.8	20.6	6.8	2.4	9.7	0.5	19.5	0.7	0.7	0.0	17.8	19.2
5	8"-17"	1.0	9.2	40.0	8.4	2.1	20.9	2.3	4.6	0.1	27.2	19.7	8.0	2.8	10.6	0.6	21.9	0.6	0.7	0.0	20.2	21.6
5	17"-29"	-	2.0	-	7.8	2.8	18.7	0.5	1.2	-0.1	26.1	13.6	17.7	6.2	4.3	1.3	29.4	2.6	3.1	0.0	23.4	29.0
6	0 - 2"	1.6	1.6	64.0	8.2	1.2	19.2	0.7	2.1	-0.1	32.2	17.0	6.3	1.3	4.1	0.6	12.3	0.7	0.4	0.0	11.0	12.1
6	2"-6"	1.4	1.9	63.0	8.1	1.7	17.8	0.3	2.5	-0.1	18.2	6.3	9.2	2.0	5.9	0.9	17.9	1.6	0.9	0.0	15.2	17.[illegible]
6	6"-19"	2.3	6.5	92.0	8.1	1.5	18.9	0.3	2.4	-0.1	31.7	16.8	8.0	1.8	5.2	0.7	15.7	0.6	0.7	0.0	14.1	15.5
8	0 - 6"	2.7	2.3	108.0	7.9	1.4	21.5	0.5	2.0	-0.1	27.5	18.8	7.0	2.4	4.3	1.0	14.8	0.2	0.9	0.9	13.5	14.6
9	0 - 5"	0.5	2.4	22.5	8.3	1.3	20.5	0.8	2.7	-0.1	17.7	7.5	4.9	2.3	5.1	1.0	13.3	0.5	0.5	0.0	12.2	13.1
9	5"-9"	2.5	0.9	100.0	7.7	1.6	15.1	0.3	2.5	-0.1	29.8	18.5	6.6	3.1	5.5	1.3	16.6	1.5	1.1	0.0	13.7	16.4
9	9"-18"	1.9	1.5	76.0	7.9	1.4	21.6	0.2	2.3	-0.1	32.0	21.7	6.3	2.8	5.0	1.2	15.2	1.0	0.8	0.0	13.2	15.0
10	0 - 5"	3.4	5.2	100.0	8.1	2.1	20.4	0.5	2.6	-0.1	18.2	7.2	10.8	3.1	6.9	1.4	22.1	0.1	1.6	0.0	20.1	21.8
10	5"-11"	4.5	1.4	120.0	7.8	1.6	19.0	0.2	2.2	-0.1	25.3	13.4	8.5	2.2	5.1	1.0	16.7	0.3	1.2	0.0	15.0	16.5
10	11"-19"	3.3	7.1	120.0	8.3	3.3	16.0	7.3	3.2	-0.1	32.7	19.9	17.3	4.5	10.6	2.1	34.6	10.9	2.2	0.0	21.0	34.1
11	0 - 5"	1.2	1.0	48.0	8.0	1.5	21.0	0.2	2.4	-0.1	35.4	21.0	7.1	2.8	5.4	0.6	15.8	1.2	0.8	0.0	13.6	15.6
11	5"-11"	0.9	8.7	36.0	9.5	1.7	19.9	1.6	3.4	-0.1	29.2	16.6	8.0	2.1	7.7	0.7	18.4	0.5	0.6	0.0	17.1	18.2
11	12"-17"	0.6	9.1	27.0	8.8	2.9	20.9	19.0	3.4	-0.1	17.0	7.2	13.7	5.4	10.4	1.2	30.7	2.3	1.7	0.0	26.3	30.2
11	17"-25"	1.8	8.6	72.0	8.4	1.6	18.7	0.2	3.2	0.1	27.7	16.5	7.2	1.9	7.0	0.6	16.8	0.7	0.5	0.0	15.3	16.5
11	25"-50"	1.7	1.6	76.5	8.2	2.2	20.5	0.2	3.3	-0.1	15.9	6.4	10.8	3.1	8.5	1.9	23.5	1.6	1.0	0.0	20.5	23.1
12	0 - 6"	3.6	5.3	120.0	9.5	7.5	19.2	42.7	52.3	-0.1	31.1	18.6	2.9	1.2	74.5	0.6	79.1	63.8	3.3	3.3	7.8	78.7
12	6"-16"	1.3	4.8	58.0	8.2	0.7	14.5	7.6	1.3	-0.1	16.8	6.3	3.0	1.6	2.0	0.4	7.0	3.6	0.5	0.0	2.8	6.9
12	16"-21"	2.0	5.6	90.0	8.3	0.7	16.4	4.0	1.2	-0.1	17.2	6.9	3.5	2.0	2.0	0.4	7.8	3.7	0.4	0.0	3.6	7.7
12	21"-60"	0.8	4.6	36.0	8.4	0.8	19.0	2.9	1.1	-0.1	17.0	6.8	3.9	2.1	2.0	0.5	8.5	1.1	0.4	0.0	6.9	8.3

DRILL HOLE NUMBER AND INTERVAL		EXCHANGEABLE CATIONS meq./liter					PLANT NUTRIENTS ppm										
		Ca	Mg	Na	K	TOTAL	Zn	Fe	Mn	Cu	P	SO4-S	K	NO3-N	NH4-N	B	Mo
1	0 - 6"	7.5	6.9	1.7	1.0	17.1	0.4	98.0	17.0	1.5	16.0	990.0	460.0	30.0	2.8	0.7	0.9
1	6"-16"	11.1	11.0	3.4	0.7	26.3	0.4	83.0	18.0	2.7	11.0	600.0	340.0	66.5	12.3	0.6	0.7
1	16"-31"	16.2	2.1	0.4	0.2	18.9	0.1	2.7	3.1	0.4	9.0	50.0	110.0	20.1	1.2	0.2	0.4
1	31"-60"	13.3	1.4	0.0	0.2	14.9	0.1	2.2	3.6	0.3	3.0	29.0	90.0	14.6	1.0	0.3	0.2
2	0 - 7"	19.5	2.8	0.1	0.1	22.5	0.1	3.4	7.2	0.6	5.0	31.0	65.0	23.6	2.2	0.6	0.7
2	7"-11"	15.1	4.7	0.2	0.1	20.0	0.1	1.2	3.0	0.4	2.0	8.0	39.0	14.1	0.6	0.2	0.4
2	11"-17"	14.1	1.2	0.0	0.6	15.9	0.1	2.3	3.6	0.3	7.0	11.0	230.0	30.0	1.9	0.3	0.2
2	17"-28"	16.1	1.2	0.1	0.2	17.6	0.1	1.9	3.3	0.3	7.0	16.0	73.0	20.1	1.0	0.3	0.2
2	28"-50"	12.4	10.7	1.9	0.3	25.3	2.4	87.0	19.0	1.8	9.0	650.0	160.0	72.0	17.5	0.9	0.1
3	0 - 1"	12.0	9.7	1.2	0.1	23.1	0.2	64.0	15.0	2.3	10.0	270.0	85.0	24.6	2.6	0.2	1.1
3	1"-8"	14.0	2.3	0.1	0.2	16.5	0.2	1.6	4.4	0.6	7.0	34.0	84.0	25.6	2.6	0.3	0.8
3	8"-15"	12.1	5.5	6.9	0.1	24.7	0.1	2.1	8.2	0.6	8.0	26.0	77.0	44.6	3.3	2.1	0.[illegible]
4	0 - 2"	17.5	4.5	0.4	0.1	22.6	0.1	1.3	4.8	0.7	3.0	10.0	49.0	16.5	1.3	0.4	0.3
4	2"-6"	8.2	6.7	5.6	0.0	20.6	0.1	1.8	7.4	0.2	2.0	17.0	32.0	13.5	0.4	0.4	0.5
4	6"-14"	14.7	2.0	0.1	0.3	17.1	0.2	3.3	6.9	0.7	14.0	12.0	150.0	38.1	4.4	0.8	0.3
4	14"-21"	15.0	4.3	0.1	0.2	19.6	0.2	3.9	10.0	0.9	11.0	11.0	110.0	28.8	2.6	0.4	0.7
4	21"-43"	14.9	3.2	0.2	0.1	18.3	0.1	2.7	2.0	0.2	2.0	8.0	37.0	14.6	0.6	0.2	0.6
4	43"-62"	16.0	3.5	0.9	0.0	20.5	0.1	1.3	3.9	0.6	1.0	13.0	47.0	20.9	1.4	1.9	0.8
5	0 - 8"	18.5	4.3	0.0	0.1	23.0	0.1	1.7	6.5	0.8	6.0	10.0	50.0	18.6	1.3	0.4	0.3
5	8"-17"	13.9	6.4	0.5	0.1	20.9	0.2	1.8	5.5	0.6	1.0	8.0	38.0	15.8	0.8	0.5	0.1
5	17"-29"	15.3	2.6	0.1	0.7	18.7	5.5	15.0	9.8	0.8	26.0	17.0	290.0	99.0	22.8	1.3	0.1
6	0 - 2"	16.6	2.4	0.1	0.1	19.2	0.1	1.4	5.2	0.4	1.0	15.0	51.0	20.1	1.6	0.3	0.7
6	2"-6"	16.0	1.4	0.1	0.3	17.8	0.3	4.1	4.3	0.3	4.0	15.0	130.0	33.8	2.4	0.4	0.9
6	6"-19"	17.4	1.2	0.0	0.3	18.9	0.1	4.8	4.9	0.4	10.0	9.0	90.0	27.7	3.2	0.4	0.5
8	0 - 6"	17.5	3.3	0.1	0.5	21.5	0.2	3.9	2.6	0.4	14.0	2.0	230.0	50.3	6.8	1.0	0.4
9	0 - 5"	18.2	2.0	0.2	0.1	20.5	0.1	2.7	0.9	0.2	1.0	7.0	53.0	12.0	0.3	0.2	0.5
9	5"-9"	11.0	3.5	0.0	0.4	15.1	0.4	7.7	5.9	0.9	18.0	17.0	210.0	56.7	7.1	0.7	0.3
9	9"-18"	17.0	4.4	0.0	0.2	21.6	0.3	5.3	11.0	0.9	11.0	16.0	94.0	30.0	2.8	0.4	0.2
10	0 - 5"	18.9	1.2	0.1	0.2	20.4	0.2	4.8	2.4	0.9	6.0	1.0	93.0	39.6	6.[illegible]	0.6	0.3
10	5"-11"	16.4	2.1	0.0	0.4	19.0	0.5	8.0	7.1	0.5	10.0	3.0	180.0	56.7	12.8	1.0	0.1
10	11"-19"	8.6	6.1	1.2	0.1	16.0	0.2	72.0	10.0	1.7	2.0	130.0	92.0	50.3	8.3	0.3	0.1
11	0 - 5"	15.9	4.9	0.0	0.1	21.0	0.1	3.0	6.8	0.8	1.0	19.0	55.0	35.1	2.1	0.2	0.4
11	5"-11"	12.9	6.6	0.3	0.0	19.9	0.2	0.8	2.7	0.4	1.0	8.0	30.0	12.0	0.5	0.1	0.3
11	12"-17"	8.8	8.1	4.0	0.0	20.9	0.1	0.7	1.8	0.4	1.0	22.0	41.0	11.1	0.3	0.2	0.3
11	17"-25"	17.0	1.6	0.0	0.0	18.7	0.1	1.0	1.9	0.3	2.0	12.0	34.0	20.9	1.9	0.3	0.2
11	25"-50"	16.9	3.4	0.0	0.1	20.5	0.1	6.1	2.6	0.3	2.0	13.0	59.0	31.2	2.7	0.4	0.2
12	0 - 6"	9.8	0.7	8.2	0.4	19.2	0.3	27.0	13.0	1.2	11.0	4800.0	190.0	52.0	2.6	0.6	0.9
12	6"-16"	12.3	0.7	1.1	0.3	14.5	0.1	2.6	0.8	0.3	2.0	210.0	140.0	7.0	0.5	0.2	0.4
12	16"-21"	13.8	1.5	0.6	0.5	16.4	0.1	2.2	0.7	0.3	1.0	180.0	190.0	9.0	0.9	0.4	0.5
12	21"-60"	16.8	1.5	0.6	0.2	19.0	0.1	2.7	1.0	0.3	2.0	30.0	86.0	5.0	0.2	0.3	0.5

DRILL HOLE NUMBER AND INTERVAL		TRACE ELEMENTS ppm									GROSS RADIO-ACTIVITY SCAN (9)			
		Co	Se	As	F	Ni	Pb	Hg	Cd	Sb	ALPHA +	-	BETA +	-
1	0 - 6"	0.2	0.03	0.06	0.36	1.3	1.0	0.001	-0.1	-1.0	20	5	31	8
1	6"-16"	0.2	0.04	0.05	0.32	3.0	1.0	0.001	-0.1	-1.0	16	4	26	6
1	16"-31"	0.1	0.03	0.04	0.29	0.7	-1.0	0.001	-0.1	1.0	17	4	19	6
1	31"-60"	-0.1	0.02	0.02	0.31	0.4	-1.0	0.001	-0.1	-1.0	14	4	20	6
2	0 - 7"	0.1	0.01	0.03	0.21	1.4	-1.0	0.001	-0.1	-1.0	19	5	29	7
2	7"-11"	-0.1	0.02	0.04	0.11	1.0	-1.0	0.001	-0.1	-1.0	20	5	26	[illegible]
2	11"-17"	0.1	0.02	0.08	0.12	0.6	-1.0	0.001	0.1	-1.0	17	4	22	5
2	17"-28"	0.1	0.01	0.07	0.23	0.6	-1.0	0.001	-0.1	-1.0	14	4	23	5
2	28"-50"	0.2	0.01	0.06	0.24	2.3	-1.0	0.001	-0.1	-1.0	16	4	[illegible]	[illegible]
3	0 - 1"	0.2	-0.01	0.04	0.51	2.6	-1.0	0.001	-0.1	-1.0	20	5	30	6
3	1"-8"	0.1	0.01	0.03	0.43	1.1	-1.0	0.001	-0.1	-1.0	18	4	24	6
3	8"-15"	-0.1	-0.01	0.04	0.36	1.1	-1.0	0.001	-0.1	-1.0	17	4	21	[illegible]
4	0 - 2"	-0.1	0.01	0.07	0.21	1.3	-1.0	0.001	-0.1	-1.0	18	4	22	6
4	2"-6"	-0.1	0.01	0.06	0.2[illegible]	1.0	-1.0	0.001	-0.1	-1.0	16	4	23	6
4	6"-14"	-0.1	0.01	0.05	0.26	0.8	-1.0	0.001	-0.1	1.0	20	5	27	6
4	14"-21"	-0.1	-0.01	0.07	0.24	1.4	-1.0	0.001	-0.1	-1.0	14	4	31	[illegible]
4	21"-43"	-0.1	-0.01	0.05	0.26	0.7	-1.0	0.001	-0.1	-1.0	14	4	29	6
4	43"-62"	-0.1	-0.01	0.06	0.21	[illegible]	-1.0	0.001	-0.1	-1.0	16	4	34	[illegible]
5	0 - 8"	0.1	-0.01	0.03	0.30	1.2	-1.0	0.003	-0.1	-1.0	19	5	34	[illegible]
5	8"-17"	-0.1	-0.01	0.02	0.34	1.0	-1.0	0.002	-0.1	-1.0	15	4	22	[illegible]
5	17"-29"	0.2	-0.01	0.03	0.32	0.7	-1.0	0.001	-0.1	1.0	14	4	24	[illegible]
6	0 - 2"	-0.1	-0.01	0.07	0.18	1.1	-1.0	0.004	-0.1	-1.0	20	5	25	[illegible]
6	2"-6"	0.1	-0.01	0.06	0.17	1.1	-1.0	0.003	-0.1	-1.0	19	5	23	8
6	6"-19"	-0.1	-0.01	0.03	0.21	1.0	1.0	0.002	-0.1	-1.0	16	4	24	6
8	0 - 6"	-0.1	0.01	0.03	0.21	0.8	-1.0	0.002	-0.1	-1.0	18	4	31	6
9	0 - 5"	-0.1	-0.01	0.06	0.18	0.8	-1.0	0.003	-0.1	-1.0	19	5	29	6
9	5"-9"	-0.1	0.01	0.04	0.17	1.3	-1.0	0.002	-0.1	-1.0	14	4	28	6
9	9"-18"	-0.1	-0.01	0.04	0.14	1.6	-1.0	0.002	-0.1	-1.0	13	4	30	6
10	0 - 5"	0.1	0.02	0.08	0.37	0.9	-1.0	0.001	-0.1	-1.0	18	4	31	6
10	5"-11"	0.1	0.01	0.11	0.42	1.2	-1.0	0.001	-0.1	1.0	16	4	21	6
10	11"-19"	0.2	-0.01	0.57	0.45	2.4	-1.0	0.001	-0.1	-1.0	16	4	24	[illegible]
11	0 - 5"	-0.1	-0.01	0.06	0.31	1.5	-1.0	0.005	-0.1	-1.0	20	5	29	6
11	5"-11"	-0.1	-0.01	0.03	0.26	0.7	-1.0	0.003	-0.1	-1.0	18	4	20	6
11	12"-17"	-0.1	-0.01	0.07	0.29	0.9	-1.0	0.003	-0.1	-1.0	17	4	19	6
11	17"-25"	0.1	-0.01	0.08	0.26	1.0	-1.0	0.002	-0.1	-1.0	15	4	20	6
11	25"-50"	-0.1	0.01	0.06	0.21	1.5	-1.0	0.002	-0.1	-1.0	15	4	18	6
12	0 - 6"	-0.1	0.01	0.04	0.31	1.1	-1.0	-0.001	-0.1	-1.0				
12	6"-16"	0.1	0.02	0.03	0.34	0.6	-1.0	-0.001	-0.1	-1.0				
12	16"-21"	0.1	0.02	0.03	0.36	0.7	-1.0	-0.001	-0.1	-1.0				
12	21"-60"	0.1	0.02	0.03	0.38	0.7	-1.0	-0.001	-0.1	-1.0				

NOTES:

(1) pH-H_2O: 1:2 SOIL WATER RATIO.
(2) CEC: CATION EXCHANGE CAPACITY IN me/100g.
(3) ESP EXCHANGEABLE SODIUM PERCENTAGE.
(4) Sal & EC: ELECTRICAL CONDUCTIVITY OF SATURATED SOIL PASTE EXTRACT IN mmhos/cm.
(5) SAR SODIUM ABSORPTION RATIO.
(6) OMN ESTIMATED NITROGEN AVAILABLE TO PLANTS IN ONE YEAR FROM DECOMPOSITION OF ORGANIC MATTER in ppm.
(7) H_2O Fld Cap.: FIELD MOISTURE CAPACITY AT 1/3 BAR IN PERCENT
(8) Wilt pt: WILTING POINT OF SOIL AT 15 BAR IN PERCENT
(9) PICOCURIES/g.

MINUS SIGN INDICATES LEVEL IS BELOW REPORTING MINIMUM.

TABLE B-2-2 CHARACTERISTICS OF ADDITIONAL SOIL SAMPLES TAKEN ON TRACT C-b
(C-b Staff Samples)

SAMPLE NO.	ANALYSIS																			
	TEXTURE	%ORGANIC	%LIME	PH-H2O	CEC	ESP	SALT-EC	OMN	CALCIUM	MAGNESIUM	POTASSIUM	SODIUM	ZINC	IRON	MANGANESE	COPPER	PHOSPHORUS	SULFATE-S	NITRATE-N	AMMONIA-N	BORON
7	SN CL LO	2.4	8.5	8.3	37.1	1.2	0.7	96.0	5400.0	390.0	140.0	100.0	0.1	1.6	0.9	0.2	8.0	30.0	5.0	0.6	0.5
8	CL LO	2.1	8.8	8.4	34.4	1.6	0.7	84.0	5000.0	360.0	70.0	120.0	0.1	1.2	0.9	0.3	1.0	16.0	10.0	1.0	0.4
9	SN CL LO	3.0	5.9	8.1	32.2	1.6	1.0	120.0	4900.0	220.0	130.0	120.0	0.2	5.3	1.7	0.3	18.0	20.0	20.0	2.0	0.6
10	SN CL LO	4.6	4.5	8.2	34.3	1.4	0.9	120.0	5200.0	240.0	130.0	110.0	0.1	3.0	1.5	0.3	11.0	5.0	12.0	2.0	0.6
11	SL CL LO	2.3	5.9	8.3	35.7	1.1	0.8	92.0	4700.0	740.0	80.0	90.0	0.3	2.4	1.3	0.4	2.0	25.0	4.0	0.5	0.5
12	SL CL LO	2.4	7.3	8.2	33.7	1.2	0.8	96.0	4900.0	370.0	95.0	90.0	0.1	4.4	1.3	0.3	6.0	25.0	7.0	0.9	0.6
13	SN CL LO	2.3	9.0	8.3	31.5	1.4	0.7	92.0	4800.0	190.0	46.0	100.0	0.1	2.0	1.0	0.2	1.0	12.0	7.0	0.8	0.4
14	SN CL LO	3.5	7.4	8.2	41.1	1.1	0.8	120.0	6100.0	390.0	89.0	110.0	0.4	3.0	1.5	0.3	9.0	18.0	7.0	1.3	0.6
15	CL LO	2.4	1.3	8.1	33.2	1.1	0.7	96.0	4500.0	580.0	95.0	80.0	0.6	4.5	3.0	0.5	2.0	20.0	4.0	0.5	0.5
16	SN CL LO	3.7	5.8	8.2	30.9	1.7	0.8	120.0	4600.0	240.0	130.0	120.0	0.4	4.4	2.1	0.3	6.0	40.0	14.0	2.0	0.7
18	SN LO	2.7	7.4	8.6	27.4	7.9	1.4	100.0	3600.0	350.0	360.0	460.0	0.1	4.8	1.5	0.4	4.0	35.0	10.0	1.3	0.7
19	SN LO	2.0	3.8	8.2	25.6	2.2	1.1	90.0	3800.0	190.0	230.0	120.0	0.1	4.1	1.7	0.3	2.0	25.0	15.0	1.5	0.6
21	SL LO	4.3	7.6	8.1	37.2	1.9	0.9	120.0	5600.0	280.0	70.0	160.0	0.1	7.0	2.5	0.3	14.0	30.0	5.0	1.1	0.6
22	SN LO	2.1	4.5	8.3	31.5	2.0	0.9	94.0	4700.0	250 0	110.0	140.0	0.2	3.1	1.1	0.3	1.0	20.0	7.0	0.7	0.6
28	SN LO	1.4	5.1	8.5	21.4	4.7	1.1	63.0	3100.0	180.0	100.0	220.0	0.1	3.2	1.4	0.3	2.0	25.0	9.0	0.7	0.6
29	SN LO	2.8	1.5	8.0	34.3	1.2	0.9	100.0	5000.0	390.0	85.0	90.0	0.1	5.6	3.0	0.3	3.0	18.0	4.0	0.5	0.5
30	SN LO	1.2	5.0	8.3	30.0	1.8	0.9	54.0	4700.0	110.0	51.0	120.0	0.1	2.7	1.2	0.3	1.0	20.0	12.0	0.7	0.5
31	SN LO	2.5	5.6	8.3	27.4	2.3	1.0	100.0	3900.0	300.0	240.0	140.0	0.5	6.6	7.2	0.6	2.0	25.0	11.0	1.3	1.0

ALL VALUES, EXCEPT WHERE OTHERWISE INDICATED,
ARE PARTS PER MILLION (PPM), AVAILABLE.

Table B-2-3 HERB FREQUENCY VALUES

VEGETATION STAND NO.[2]	VEGETATION TYPE	SPECIES[1]								
		AGSM	FEBR	KOGR	ORHY	CAPE	SPCO	STCO	BRTE	PHLO
4F & 4-0	BLSB	50	0	0	26	0	0	8	100	0
19	BLSB	10	0	0	45	0	5	0	100	0
16	BLSB	70	75	100	0	0	25	80	100	0
19	BLSB	10	0	0	45	0	5	0	100	0
1F & 1-0	CPJR	20	8	18	56	24	0	18	81	8
5F & 5-0	PJWD	16	4	0	58	30	0	4	30	0
9	PJWD	80	0	30	45	40	0	20	10	0
9	PJWD	80	0	30	45	40	0	20	10	0
13	PJWD	60	0	45	35	0	5	50	10	0
20	BUGR	10	0	0	90	0	0	0	35	0
21	DGFF	0	60	30	0	40	0	0	0	0
2F & 2-0	CPJR	26	4	10	14	4	6	4	98	8
6F & 6-0	PJWD	74	52	44	8	34	20	34	16	66
F	CPJR	85	45	55	50	40	0	50	20	0
14	CPJR	55	45	50	55	15	20	0	55	0
7	CPJR	85	45	55	50	40	0	50	20	0
8	UPSB	80	15	90	30	35	15	25	10	0
10	CPJR	55	0	40	40	0	5	50	0	0
12	PJWD	80	85	65	0	55	20	70	25	0
14	CPJR	55	45	50	55	15	20	0	55	0
11	UPSB	100	502	100	75	50	95	30	0	0
11	UPSB	100	25	100	75	50	95	30	0	0
3F & 3-0	UPSB	100	74	100	0	88	52	22	4	98
15	UPSB	100	75	100	0	45	40	65	0	0
18	GRWD	55	0	0	0	0	0	0	75	0
18	GRWD	55	0	0	0	0	0	0	75	0

[1] See Table 3-2-14 (Chapter 3, Section 2) for explanation of abbreviations.
[2] See Table B-2-5 (Appendix B, Section 2) for explanation of numbers.

Table B-2-4 SHRUB IMPORTANCE VALUES

VEGETATION STAND NO.[2]	VEGETATION TYPE	SPECIES[1]							
		OPPO	ARTR	SYOR	JUOS	PUTR	PIED	AMSP	CHNA
4F & 4-0	BLSB	12.6	245.4	0.0	0.0	2.7	0.0	0.0	7.5
19	BLSB	7.6	261.8	0.0	0.0	0.0	0.0	0.0	30.0
16	BLSB	16.4	225.6	8.2	0.0	0.0	0.0	0.0	49.8
19	BLSB	7.6	261.8	0.0	0.0	0.0	0.0	0.0	30.0
1F & 1-0	CPJR	6.8	141.7	10.1	13.3	32.3	19.5	11.3	26.5
5F & 5-0	PJWD	0.0	86.9	0.0	14.2	24.3	65.6	65.6	5.6
9	PJWD	19.4	49.8	5.8	14.8	145.6	41.8	0.0	0.0
9	PJWD	19.4	49.8	5.8	14.8	145.6	41.8	0.0	0.0
13	PJWD	0.0	14.9	113.9	4.1	23.5	11.0	34.2	4.9
20	BUGR	4.7	31.7	0.0	0.0	0.0	0.0	0.0	3.4
21	DGFF	0.0	0.0	106.1	16.0	0.0	11.8	0.0	0.0
2F & 2-0	CPJR	11.9	34.3	10.2	34.4	38.6	50.0	14.9	64.8
6F & 6-0	PJWD	45.8	171.0	3.0	16.7	2.5	23.5	25.4	26.7
F	CPJR	17.5	78.5	104.2	23.3	11.0	12.6	18.5	5.9
14	CPJR	1.6	3.2	100.9	29.2	17.9	38.3	31.3	1.6
7	CPJR	17.5	78.5	104.2	23.3	11.0	12.6	18.5	5.9
8	UPSB	19.8	247.3	0.0	10.9	0.0	8.6	0.0	7.5
10	CPJR	6.2	124.5	9.9	16.6	86.5	28.9	9.9	9.0
12	PJWD	28.3	113.1	14.2	7.5	5.7	49.6	35.0	0.0
14	CPJR	1.6	3.2	100.9	29.2	17.9	38.3	31.3	1.6
11	UPSB	24.9	235.9	2.2	7.1	0.0	21.5	2.6	0.0
11	UPSB	24.9	235.9	2.2	7.1	0.0	21.5	2.6	0.0
3F & 3-0	UPSB	23.8	234.2	0.0	2.8	0.0	16.0	16.8	5.0
15	UPSB	2.6	133.8	41.6	0.0	1.2	7.7	49.2	58.8
18	GRWD	0.0	7.2	0.0	0.0	0.0	0.0	0.0	46.9
18	GRWD	0.0	7.2	0.0	0.0	0.0	0.0	0.0	46.9

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[1] See Table 3-2-13 (Chapter 3, Section 2) for explanation of abbreviations.
[2] See Table B-2-5 (Appendix B, Section 2) for explanation of numbers.

Table B-2-5 LISTING OF SAMPLING SITES

STAND NUMBER	STAND TYPE
1F & 1-0	CPJR CHAINED PINYON-JUNIPER RANGELAND (EXPERIMENTAL SITE)
2F & 2-0	CPJR CHAINED PINYON-JUNIPER RANGELAND (CONTROL SITE)
3F & 3-0	UPSB UPLAND SAGEBRUSH COMMUNITY
4F & 4-0	BLSB BOTTOMLAND SAGEBRUSH COMMUNITY
5F & 5-0	PJWD PINYON-JUNIPER WOODLAND (EXPERIMENTAL SITE)
6F & 6-0	PJWD PINYON-JUNIPER WOODLAND (CONTROL SITE)
7	CPJR CHAINED PINYON-JUNIPER RANGELAND
8	UPSB UPLAND SAGEBRUSH COMMUNITY
9	PJWD PINYON-JUNIPER WOODLAND (EAST-FACING SLOPE)
10	CPJR CHAINED PINYON-JUNIPER RANGELAND
11	UPSB UPLAND SAGEBRUSH COMMUNITY
12	PJWD PINYON-JUNIPER WOODLAND
13	PJWD PINYON-JUNIPER WOODLAND
14	CPJR CHAINED PINYON-JUNIPER RANGELAND
15	UPSB UPLAND SAGEBRUSH COMMUNITY
16	BLSB BOTTOMLAND SAGEBRUSH COMMUNITY
17	RABR RABBITBRUSH COMMUNITY
18	GRWD GREASEWOOD COMMUNITY
19	BLSB BOTTOMLAND SAGEBRUSH COMMUNITY
20	BUGR BUNCHGRASS COMMUNITY
21	DGFF DOUGLAS-FIR FOREST
22	ANWD ANNUAL WEED COMMUNITY
23	ANWD ANNUAL WEED COMMUNITY
24	ANWD ANNUAL WEED COMMUNITY
25	ANWD ANNUAL WEED COMMUNITY

SOIL UNITS

ID	IDENTIFICATION
41	GLENDIVE - FINE SANDY LOAM 2 - 15 PERCENT SLOPES
63	RENTSAC CHANNERY (FINE SANDSTONE) FINE SANDY LOAM 5 - 50 PERCENT SLOPES
66	RED CREEK - RENTSAC COMPLEX 5 - 30 PERCENT SLOPES
70	PICEANCE FINE SANDY LOAM 5 - 15 PERCENT SLOPES
71C	FORELLE LOAM 3 - 8 PERCENT SLOPES
75	RIVRA - GRAVELLY, LOAMY FINE SAND 2 - 9 PERCENT SLOPES

Table B-2-6 SUMMARY OF SIGNIFICANT CORRELATION COEFFICIENTS AND T-VALUES FOR SHRUB IMPORTANCE VALUES

SPECIES OF SHRUBS

		OPPO	ARTR	SOYR	JUOS	PUTR	PIED	AMSP	CHNA
		-T-Values →							
OPPO	Coefficient of Correlation								
ARTR		.49^{+}							
SOYR		-.36	-.55*		3.33*		-3.51*	2.77*	-2.59*
JUOS			-.43^{+}	.35			4.26*	-2.68*	
PUTR			-.29		.35				
PIED			-.31		.63*	.46^{+}		5.33*	-2.19*
AMSP							.57*		
CHNA									

*Significant T-values (95 percent confidence)

Significant Coefficient of Correlation

Confidence Interval Codes

*95 percent R ≷ .51

$^{+}$90 percent R ≷ .42

75 percent R ≷ .29

Table B-2-7 SUMMARY OF SIGNIFICANT COEFFICIENTS OF CORRELATION AND T-VALUES FOR HERB FREQUENCY

SPECIES OF HERBS

T-Value →

Coefficient of Correlation

	AGSM	FEBR	KOGR	ORHY	CAPE	SPCO	STCO	BRTE	PHLO	STLO
AGSM										
FEBR	.47^{+}									
KOGR	.80*	.70*				2.10*				
ORHY		-.56*	-.29							
CAPE	.54*	.61*	.58*					-2.15*		
SPCO	.63*	.44^{+}	.74*		.54*					
STCO	.63*	.55*	.68*	-.34		.29				
BRTE	-.44^{+}		-.47^{+}		-.61*	-.34				
PHLO	.31	.37		-.34	.55*	.32				
STLO	-.46		-.33			-.31				

*Significant T-Value (95 percent confidence)

Significant Coefficient of Correlation

Confidence Interval Codes

*95 percent R $\gtrless$ .51

$^{+}$90 percent R $\gtrless$ .42

75 percent R $\gtrless$ .29

Table B-2-8 SUMMARY OF SIGNIFICANT CORRELATION COEFFICIENTS AND T-VALUES FOR SOIL CHARACTERISTICS

T-Values →

Coefficient of Correlation

	NO$_3$	NH$_4$	P	K	Ca	Mg	SO$_4$	Fe	Zn	Cu	Mn	B	CEC	pH	% Lime	Salt	ESP	PWC	FC	% AW	% OM	% OMN
NO$_3$		3.13*	2.42*		-3.90*						-2.36*					2.54*						
NH$_4$	.38				3.30*						2.79*					2.70*	-2.17*				2.30*	
P	.46$^+$				2.36*																	
K																	2.46*					
Ca		.44$^+$	-.30	-.61*							-2.46*		4.76*				-2.30*					
Mg	-.34	-.39											2.25*		-2.21*		3.81*				2.87*	
SO$_4$	-.30																					
Fe			.68*		-.51*									-2.38*								
Zn			.52*		-.43$^+$			.94*			2.29*			-2.32*								
Cu		-.47$^+$	.42$^+$	.39	-.55*			.82*	.87*													
Mn			.58*		-.48$^+$			.92*	.94*	.84*				-4.80*								
B	.43$^+$		.38	.66*	-.55*																	
CEC	-.38	.32	-.30	-.56*	.97*			-.49$^+$	-.38	-.47$^+$	-.43$^+$	-.54*										
pH			-.64*		.36			-.79*	-.82*	-.72*	-.90*		.31									
%Lime		.33	-.52*		.68*	-.30		-.58*	-.52*	-.64*	-.60*	-.40	.62*	.56*								
Salt		.68*	-.30					-.41	-.44$^+$	-.58*	-.32			.41	.42$^+$							
ESP				.62*	-.46$^+$		.33					.33	-.46$^+$	.30		.51*						
PWC	-.34			-.57*	.52*	.55*						-.56*	.61*				-.65*		803.6*	284.9*		
FC				-.37		.53*			.43$^+$	.35	.34	-.32	.32	-.49$^+$		-.59*	-.78*	.82*		374.3*		
% AW		-.56*	.48$^+$		-.39		-.36	.60*	.58*	.69*	.46*		-.34	-.54*	-.55*	-.91*	-.40		.54*			
% OM			.62*					.73*	.65*	.59*	.65*			-.63*	-.36	-.45$^+$			.40	.59*		5.87*
% OMN			.58*					.80*	.72*	.67*	.64*			-.60*	-.43$^+$	-.59*			.42$^+$	.73*	.92*	

+ Significant T-Value (Regression coefficient is significant) at 5 percent level
* Significant Coefficient of Correlation (5 percent level: R < -.51 or R > .51)

Confidence Interval Codes

*95 percent confidence interval R ± .51
$^+$90 percent confidence interval R ± .42
75 percent confidence interval R ± .29

Table B-2-9 TYPICAL COMPUTER OUTPUT FOR CORRELATION AND REGRESSION ANALYSIS

```
 MULTIPLE REGRESSION.....,VAL1
      SELECTION ... 4

 :01262201020304050607080910111213141516171819202122
 VARIABLE                  STANDARD     CORRELATION   REGRESSION    STD. ERROR     COMPUTED
 NO. NAME       MEAN       DEVIATION       X VS Y     COEFFICIENT   OF REG.COEF.   T VALUE
  1 NO3        9.55000      5.79904      -0.13283      -0.00000      0.00011      -0.00937
  2 NH4        0.90500      0.60304       0.03848      -0.00070      0.02327      -0.03015
  3 P          8.35000      7.58998       0.44656       0.00001      0.00025       0.04392
  4 K        145.64999     83.20306      -0.40796      -0.00000      0.00002      -0.07368
  5 Ca      4340.00000   1020.01001       0.39899       0.00000      0.00001       0.08447
  6 Mg       339.00000    148.21391       0.25149       0.00006      0.00072       0.08442
  7 SO4       21.84999      9.85299      -0.27306      -0.00154      0.08084      -0.01902
  8 Fe         5.73000      5.99114       0.26168       0.00000      0.00030       0.01300
  9 Zn         0.42500      0.76769       0.23964      -0.00194      0.05754      -0.03379
 10 Cu         0.42500      0.25726       0.09307       0.00045      0.00169       0.26883
 11 Mn         2.04000      1.92146       0.19412      -0.00001      0.00033      -0.02118
 12 B          0.60000      0.12978      -0.18213       0.00541      0.13187       0.04100
 13 CEC       30.48494      5.85349       0.43800       0.00000      0.00002       0.01252
 14 pH         8.19999      0.29380      -0.32419      -0.00071      0.00529      -0.13469
 15 %LIM       5.27999      2.70858       0.07730      -0.00002      0.00070      -0.03426
 16 SALT       0.72000      0.31221      -0.15467       0.01226      0.00430       2.85143
 17 ESP        2.10499      1.58229      -0.44963      -0.00337      0.01999      -0.16850
 18 PWC       16.16498      5.24918       0.37351      -0.00131      0.01436      -0.09090
 19 FC        23.89996      6.22363       0.42815       0.18516      0.27984       0.66168
 20 %AW        7.73500      3.55709       0.19791      -0.14057      0.69846      -0.20126
 21 %OM        3.16000      1.17267       0.42770       1.68024      3.33131       0.50438
 22 OMN      116.20000     36.66718       0.33068      -0.02540      0.12703      -0.19997
 DEPENDENT
 26 JUOS       3.54500      3.00604

 INTERCEPT                 -2.11943

 MULTIPLE CORRELATION       0.55769

 STD. ERROR OF ESTIMATE     6.27936


                      ANALYSIS OF VARIANCE FOR THE REGRESSION
        SOURCE OF VARIATION        DEGREES       SUM OF          MEAN
                                  OF FREEDOM     SQUARES         SQUARES        F VALUE
 ATTRIBUTABLE TO REGRESSION          22          53.39835         2.42720      -0.06156
 DEVIATION FROM REGRESSION           -3         118.29099       -39.43033
    TOTAL                            19         171.68933
 MULTIPLE REGRESSION.....,VAL1
      SELECTION .... 4

      TABLE OF RESIDUALS

      CASE NO.       Y VALUE       Y ESTIMATE       RESIDUAL

         1           0.00000        2.42178        -2.42178
         2           0.00000        4.66675        -4.66675
         3           0.00000        1.25160        -1.25160
         4           0.00000        0.26412        -0.26412
         5           3.30000        2.28360         1.01640
         6           6.00000        4.98825         1.01175
         7           4.20000        4.71901        -0.51901
         8           4.80000        3.34391         1.45609
         9           4.10000        2.83138         1.26862
        10           4.40000        2.39278         2.00722
        11           3.30000        3.22357         0.07643
        12           6.60000        6.59855         0.00145
        13           9.20000        4.54732         4.65268
        14           6.70000        6.75922        -0.05922
        15           7.50000        3.01560         4.48440
        16           0.90000        3.81360        -2.91360
        17           7.10000        4.41748         2.68252
        18           2.80000        3.76557        -0.96557
        19           0.00000        4.31573        -4.31573
        20           0.00000        1.28051        -1.28051
```

Table B-3-1 ALPHABETICAL LISTING OF COMMON NAMES FOR THE FLORA OF TRACT C-b

Common Name	Scientific Name
TREES, SHRUBS, AND VINES	
Antelope bitterbrush	Purshia tridentata
Big sagebrush	Artemisia tridentata
Bitterbrush	Purshia tridentata
Blue clematis	Clematis columbiana
Box elder	Acer negundo
Chokecherry	Prunus virginiana var. melanocarpa
Currant	Ribes cereum
Douglas-fir	Pseudotsuga menziesii
Four-winged saltbush	Atriplex canescens
Gambel's oak	Quercus gambelii
Golden currant	Ribes aureum
Greasewood	Sarcobatus vermiculatus
Horsebrush	Tetradymia canescens
Mormon tea	Ephedra viridis
Mountain mahogany	Cercocarpus montanus
Narrow-leaf cottonwood	Populus angustifolia
Oregon grape	Mahonia repens
Pinyon pine	Pinus edulis
Prickly pear	Opuntia polyacantha
Rabbitbrush	Chrysothamnus viscidiflorus
Rock spirea	Holodiscus dumosus
Rocky Mountain juniper	Juniperus scopulorum
Rubber rabbitbrush	Chrysothamnus nauseosus
Serviceberry	Amelanchier alnifolia
Shadscale	Atriplex confertifolia
Siberian elm	Ulmus pumila
Silver buffaloberry	Shepherdia argentea
Skunkbush	Rhus trilobata
Smooth currant	Ribes inerme

Table B-3-1 (Continued)

Common Name	Scientific Name
Snakeweed	Gutierrezia sarothrae
Snowberry	Symphoricarpos orephilus
Utah juniper	Juniperus osteosperma
Utah serviceberry	Amelanchier utahensis
Western virgin's-bower	Clematis ligusticifolia
Wildbuckwheat	Eriogonum lonchophyllum
Wild hops	Humulus lupulus var. neomexicanus
Wild rose	Rosa woodsii
Willow	Salix exigua
Winter fat	Ceratoides lanata
HERBS	
Actinea	Hymenoxis acaulis
Alfalfa	Medicago sativa
Alumroot	Heuchera parvifolia
Annual spurge	Chaemaesyce glyptosperma
Aster	Aster adscendens
Aster	Aster sp.
Baby blue eyes	Collinsia parviflora
Balsam root	Balsamorhiza sagittata
Baltic rush	Juncus arcticus spp. ater
Barnyard grass	Echinchloa crus-galli var. mitis
Bastard toadflax	Comandra pallida spp. umbellata
Beard tongue	Penstemon lentus
Bee plant	Cleome serrulata
Biennial wormwood	Artemisia biennis
Biscuitroot	Lomatium orientale
Blue-bunch wheatgrass	Agropyron spicatum
Blue grama	Bouteloua gracilis
Bluegrass	Poa arida
Blue lettuce	Lactuca tatarica spp. pulchella

Table B-3-1 (Continued)

Common Name	Scientific Name
Canada thistle	*Cirsium arvense*
Cancer root	*Orobanche fasciculata*
Cattail	*Typha latifolia*
Cheatgrass	*Bromus tectorum*
Checker mallow	*Sidalcea neomexicana*
Chorispora	*Chorispora tenella*
Cinquefoil	*Potentilla gracilis*
Clover	*Trifolium gymnocarpon*
Collomia	*Collomia linearis*
Colorado bedstraw	*Galium coloradoensis*
Common reed	*Phragmites australis*
Common sunflower	*Helianthus annuus*
Crested wheatgrass	*Agropyron desertorum*
Cryptantha	*Cryptantha sericea*, *Cryptantha* sp.
Curly-cup gumweed	*Grindelia squarrosa*
Daisy Fleabane	*Erigeron nematophyllus*
Dandelion	*Taraxacum officinale*
Darnel	*Lolium perenne*
Death camas	*Zigadenus venenosus* var. *gramineus*
Dock	*Rumex* sp.
Double bladderpod	*Physaria floribunda*
Easter daisy	*Townsendia hookeri*, *Townsendia incana*
Eriogonum	*Eriogonum flexum*
Evening primrose	*Calylophus hartwegii* spp. *lavandulifolius* *Oenothera trichocalyx*, *Oenothera* sp.
Evening star	*Mentzelia rusbyi*, *Mentzelia dispersa*
Fairy candelabra	*Androsace septentrionalis*
False dandelion	*Agoseris glauca*
False flax	*Camelina microcarpa*
False gromwell	*Onosmodium molle* var. *occidentalis*
False pennyroyal	*Hedeoma drummondii*
False Solomon's seal	*Smilacina stellata*

Table B-3-1 (Continued)

Common Name	Scientific Name
False yarrow	Chaenactus douglasii
Fireweed	Epilobium sp.
Foxtail barley	Hordeum jubatum
Fremont penstemon	Penstemon fremontii
Glaucous aster	Aster glaucodes
Goat's beard	Tragopogon dubius
Golden aster	Heterotheca villosa
Golden ragwort	Senecio multilobatus
Gloden smoke	Corydalis aurea
Goldenrod	Solidago sparsiflora
Goldenweed	Haplopappus nuttallii, Haplopappus acaulis
Goosefoot	Chenopodium fremontii, Chenopodium album
Great Basin wildrye	Elymus cinereus
Green sage	Artemisia dracunculus spp. glauca
Gumbo lily	Oenothera caespitosa
Hawks beard	Crepis acuminata
Horsetail	Equisetum arvense
Horehound	Marrubium vulgare
Horseweed	Conyza canadensis
Hymenopappus	Hymenopappus filifolius
Indian paintbrush	Castilleja chromosa, Castilleja linariaefolia
Indian ricegrass	Oryzopsis hymenoides
Japanese brome	Bromus japonicus
Junegrass	Koeleria gracilis
Kentrophyta milk vetch	Astragalus kentrophyta
Kentucky bluegrass	Poa pratensis
Knotweed	Polygonum douglasii, Polygonum sawatchense
Larkspur	Delphinium nelsoni
Little ricegrass	Oryzopsis micrantha
Long-leaved phlox	Phlox longifolia
Lupine	Lupinus argenteus
Marestail	Hippuris vulgaris

Table B-3-1 (Continued)

Common Name	Scientific Name
Mariposa lily	*Calochortus gunnisoni, Calochortus nuttallii*
Marsh elder	*Iva xanthifolia*
Mat penstemon	*Penstemon caespitosus*
Meadow goldenrod	*Solidago canadensis*
Meadow milkvetch	*Astragalus diversifolius*
Mentzelia	*Mentzelia dispersa*
Microsteris	*Microsteris gracilis*
Miner's candle	*Cryptantha* sp.
Moss phlox	*Phlox hoodii*
Mountain brome	*Bromus marginatus*
Mountain peppergrass	*Lepidium montanum*
Much-branched gayophytum	*Gayophytum ramosissimum*
Mutton grass	*Poa fendleriana*
Narrow leaf gromwell	*Lithospermum incisum*
Needle-and-thread grass	*Stipa comata*
Nodding brome	*Bromus porteri*
Nodding eriogonum	*Eriogonum cernuum*
Nuttall's sunflower	*Helianthus nuttallii*
Nuttall's yellow violet	*Viola nuttallii*
Orchard grass	*Dactylis glomerata*
Painted milkvetch	*Astragalus ceramicus*
Pasque flower	*Pulsatilla patens* spp. *multifida*
Pasture sage	*Artemisia frigida*
Pearly everlasting	*Anaphalis margaritacea*
Peppergrass	*Lepidium perfoliatum*
Phacelia	*Phacelia idahoensis*
Pigweed	*Amaranthus retroflexus*
Prairie bulrush	*Scirpus paludosus*
Prickly gilia	*Leptodactylon pungens*
Prickly lettuce	*Lactuca serriola*
Puccoon	*Lithospermum* sp.
Pursh's Milk vetch	*Astragalus purshii*

Table B-3-1 (Continued)

Common Name	Scientific Name
Pussytoes	Antennaria rosea, Antennaria parvifolia
Rabbit's-foot grass	Polypogon monspelliensis
Ragweed	Ambrosia artemisiifolia
Ragwort	Senecio eremophilus var. kingii
Red top	Agrostis gigantea
Rock cress	Arabis holboellii
Rocky Mountain milk vetch	Astragalus scopulorum
Russian thistle	Salsola iberica
Sagebrush buttercup	Ranunculus glaberrimus
Sagewort	Artemisia ludoviciana
Sand dropseed	Sporobolus cryptandrus
Scarlet gilia	Ipomopsis aggregata
Scarlet globe mallow	Sphaeralcea coccinea
Scouring rush	Equisetum hyemale, Equisetum laevigatum
Seaside arrowgrass	Triglochin maritima
Sedge	Carex aquatilis, Carex atherodes, Carex heliophila, Carex lanuginosa, Carex simulata
Sheep fescue	Festuca brachyphylla
Shore buttercup	Ranunculus cymbalaria
Short-rayed alkali aster	Brachyactis frondosa
Showy milkweed	Asclepias speciosa
Slender wheatgrass	Agropyron trachycaulum
Sloughgrass	Beckmannia syzigachne
Smooth brome	Bromus inermis
Sow thistle	Sonchus arvensis
Speedwell	Veronica salina
Spikerush	Eleocharis macrostachya
Spoonleaf milk vetch	Astragalus spatulatus
Spreading dogbane	Apocynum androsaemifolium
Spurge	Euphorbia robusta
Squirreltail grass	Sitanion longifolium
Stephanomeria	Stephanomeria tenuifolia

Table B-3-1 (Continued)

Common Name	Scientific Name
Stickseed	Lappula redowskii
Stinging nettle	Urtica dioica
Sugarbowls	Clematis hirsutissima
Sulphur flower	Eriogonum umbellatum
Summer-cypress	Kochia iranica
Sweet vetch	Hedysarum boreale
Tansy mustard	Descurainia pinnata
Tassel-flower brickellbrush	Brickellia grandiflora
Thistle	Cirsium sp.
Timothy	Phleum pratense
Tobacco	Nicotiana attenuata
Tule	Scirpus lacustris spp. valdius
Tumble mustard	Sisymbrium altissimum, Sisymbrium officinale
Twistflower	Streptanthus cordatus
Umbrellawort	Oxybaphus linearis
Utah daisy fleabane	Erigeron utahensis
Watercress	Rorippa nasturtium-aquaticum
Watson Penstemon	Penstemon watsonii
Western gromwell	Lithospermum ruderale
Western wallflower	Erysimum asperum
Western wheatgrass	Agropyron smithii
White draba	Draba reptans
White pigweed	Amaranthus albus
White sweet clover	Melilotus alba
Wild buckwheat	Eriogonum ovalifolium
Wild flax	Linum lewisii
Wild licorice	Glycyrrhiza lepidota
Wild onion	Allium acuminatum
Winged eriogonum	Eriogonum alatum
Wing-fruited sand verbena	Tripterocalyx micranthus
Yarrow	Achillea lanulosa

Table B-3-1 (Continued)

Common Name	Scientific Name
Yellow evening primrose	*Oenothera strigosa*
Yellow sweet clover	*Melilotus officinalis*
Yucca	*Yucca glauca*

Table B-3-2 VASCULAR FLORA FOR TRACT C-b FORMAT OF THE ANNOTATED FLORA

Scientific and Common Names

The scientific nomenclature used in the flora follows Harrington's Manual of the Plants of Colorado (1964). However, in order to compensate for changes that have been made in the years since its publication, a listing of currently accepted scientific names prepared by Weber and Johnston (1976) has been used to update names. Most of the older names have been included, with cross references so that desired information for any species can be retrieved.

Common names are familiar and easy to remember, but they are also ambiguous: the same common name may pertain to several different species. Generally accepted common names are given for each species listed.

Life Form

The characteristic way in which a plant grows (life form) can be used to organize and classify the plants of a region. Raunkiaer (1934) developed a classification system which groups plants on the basis of the position of the perennating bud (the part that gives rise to new growth). It may be located at the tip of a branch on a tall tree or within the seed of an annual plant. Raunkiaer's system divides all plants into seven major life forms: phanerophytes, chamaephytes, hemicryptophytes, cryptophytes, therophytes, stem succulents, and epiphytes. The major types are then divided into numerous subtypes (Appendix IV-B, Table B-3-2a).

Table B-3-2a ABBREVIATIONS OF LIFE FORMS OF PLANTS USED IN DESCRIBING THE FLORA OF TRACT C-b

---

Ph - Phanerophytes (perennating bud at least 0.25 m above soil surface)

MM - Mega-, Mesophanerophytes (>8 m in height)
M - Microphanerophytes (2-8 m in height)
N - Nanophanerophytes (0.25-2.0 m in height)
(suffix "v" with any of the above symbols indicates a vine)

Ch - Chamaephytes (perennating bud between 0 and 0.25 m above soil surface)

Cha - active chamaephytes
Chp - passive chamaephytes
Chcp - cushion plants

H - Hemicryptophytes (perennating bud in soil surface)

Hp - Proto-hemicryptophytes without runners (plant leafy throughout)
Hs - Semirosette without runners (plant with large basal leaves and smaller cauline leaves)
Hr - Rosette without runners (plant with well-developed basal leaves and no cauline leaves)
Hpr - Proto-hemicryptophytes with runners
Hsr - Semirosette with runners
Hrr - Rosette with runners (runner is here used for either hypogeal or epigeal shoot)

Cr - Cryptophytes (perennating buds covered by soil or water)

G - Geophytes (perennating buds covered by soil)

Grh - Rhizome
Gst - Stem-tuber
Grt - Root-tuber
Gb - Bulb
Gr - Root-bud
Gp - Root-parasite

HH - Helo-, hydrophytes (perennating buds covered by water)

Th - Therophytes (annual plants, perennating buds contained in seed)

S - Stem succulents (stems enlarged; serve as water storage organ)

Attempts have been made to correlate life forms with regional climate. Relationships can be seen, but for the most part, they are rather general. Deserts tend to have high percentages of annuals (therophytes), and tropical forests are composed mostly of trees and large shrubs (phanerophytes).

Most of the plants on Tract C-b are hemicryptophytes (49.6 percent); while therophytes comprise 16.5 percent of the flora. Comparison of the life form spectrum for Tract C-b with Raunkiaer's normal spectrum (a world average) (Appendix IV-B, Table B-3-2b) shows that hemicryptophytes are 1.8 times as prevalent, and phanerophytes are only 0.4 times as prevalent. While cryptophytes account for only 14.8 percent of the flora, they 2.3 times as prevalent as in the normal spectrum, thus producing a flora which is characterized by hemicryptophytes and cryptophytes. The life form spectrum of the flora (Appendix IV-B, Table B-3-2b) suggests a shrubland with a high percentage of herbaceous perennials.

Statement of Abundance

The qualitative statements of abundance are based on field observations and range along a continuous scale divided into six categories: rare, scattered, occasional, frequent, common and abundant. In some instances these are qualified with the modifiers "very" and "relatively" to more accurately describe abundance. An abundant species is one which would be commonly encountered almost anywhere within the study area, whereas a very rare species might require several weeks of searching to locate and is usually known from only one site. The abundance statements are likely to be

Table B-3-2b LIFE FORM SPECTRUM OF SPECIES[1] ON TRACT C-b

Life Form	Percentage Distribution of Species: Tract C-b	Normal Spectrum[2]
Phanerophytes	14.8	46.0
Chamaephytes	3.9	9.0
Hemicryptophytes	49.6	26.0
Cryptophytes	14.8	6.0
Therophytes	16.5	13.0

[1] 230 species.
[2] After Raunkiaer, (1934)

changed as additional field work is conducted. Species new to the flora will be located, and additional sightings of rare species are likely.

Community Affinity

The species which comprise the Tract C-b flora are not uniformly distributed throughout the study area. Some species are restricted to specialized environments, while others tolerate a broad range of environmental characteristics. The community affinity given for each species in the flora describes the habitat type where that species is most likely to be encountered. In most instances the communities which are mentioned correspond to described communities of the study area, but in some instances species are restricted to very specific sites within major communities. Mormon tea, for example, is found only on sandstone outcrops within pinyon-juniper woodlands (on Tract C-b). As more observations of species are made, some of the community affinity descriptions may be modified.

Distributional Status

Two levels of distribution are presented in the flora. The first simply states whether a species is either native or introduced within the study area; the second examines more closely the distribution of each species. Based on geographic distributions presented by Scoggan (1957) in his floral treatment of the plants of Manitoba, each of the species is assigned to one of 17 distribution types (Appendix IV-B, Table B-3-2c).

The greatest portion of the flora (79.9 percent) is made up of species having characteristic North American distributions

Table B-3-2c SUMMARY OF THE GEOGRAPHICAL DISTRIBUTION OF THE SPECIES PRESENT IN THE FLORA OF TRACT C-b

Geographical Distribution	Number of Species	Percent of Flora
Circumpolar Distributions		
Arctic circumpolar (Ca)	5	2.2
Arctic-subarctic circumpolar (Cas)	4	1.7
Subarctic circumpolar (Cs)	3	1.3
Subarctic-temperate circumpolar (Cst)	2	0.9
Temperate circumpolar (Ct)	2	0.9
Subtotal	16	7.0
American Distributions		
Arctic American (Aa)	1	0.4
Arctic-subarctic American (Asa)	2	0.9
Subarctic American (As)	14	6.1
Western (Asw)	7	3.0
Subarctic-temperate Amer. (Ast)	10	4.3
Western (Astw)	13	5.7
Temperate American (At)	12	5.2
Western (Atw)	125	54.3
Subtotal	184	79.9
Other Distributions		
European (Ep)	14	6.1
Eurasian (Er)	15	6.5
Tropical American (Ta)	1	0.4
Subtotal	30	13.0
Total	230	

Table B-3-2b (Continued)

(Appendix IV-B, Table B-3-2c), and 54.3 percent have temperate American Western distributions. While not apparent from these data, the flora contains Western species from two major floristic regions: the Rocky Mountains and the Intermountain West. At elevations above Tract C-b, Rocky Mountain species are more abundant; and at elevations lower than the Tract, Intermountain West species are more common. Approximately 13 percent of the species in the area are introduced; they are primarily European and Eurasian.

Family

The family for each species is given in order to allow individuals acquainted with plant families to obtain clearer insight into the flora, even though the genera may be unfamiliar.

Table B-3-2d ANNOTATED VASCULAR FLORA FOR TRACT C-b

TREES, SHRUBS, AND VINES

Acer negundo L. Box Elder. (MM). Rare on Tract C-b; moist gulches along intermittent streams (Cottonwood Gulch). Not a rare species in Colorado. At - native. Aceraceae.

Amelanchier alnifolia Nutt. Serviceberry. (M). Common; a dominant species in mixed mountain shrub communities. Asw - native. Rosaceae.

Artemisia tridentata Nutt. Big Sagebrush. (M). Abundant; valley floors, ridges, and slopes over most of the Tract. A secondary dominant in mixed mountain shrub communities and a dominant in sagebrush communities. Atw - native. Compositae.

Atriplex canescens (Pursh) Nutt. Four-winged Saltbush. (N). Scattered; dry colluvial slopes. On C-b usually found in Indian ricegrass communities. Atw - native. Chenopodiaceae.

Atriplex confertifolia (Torr. et Fremont) S. Wats. Shadscale. (N). Scattered; dry colluvial slopes and Indian ricegrass communities. Atw - native. Chenopodiaceae.

Ceratoides lanata (Pursh) J. T. Howell. Winter Fat. (N). Frequent; occurs as a secondary dominant with big sagebrush in valley sagebrush communities; uncommon elsewhere. Atw - native. Chenopodiaceae. [Syn. = *Eurotia lanata* (Pursh) Moquin].

Cercocarpus montanus Raf. Mountain Mahogany. (N). Common; a dominant species in mixed mountain shrub communities and a component of the shrub stratum in pinyon-juniper woodlands. Atw - native. Rosaceae.

Chrysothamnus nauseosus (Pall.) Britt. in Britt. et Brown. Rubber Rabbitbrush. (N). Common; a dominant species in heavily grazed valley communities; a secondary dominant on chained pinyon-juniper sites. Atw - native. Compositae.

Chrysothamnus viscidiflorus (Hook.) Nutt. Little Rabbitbrush. (N). Occasional; ridges and chained pinyon-juniper woodlands. Less common than rubber rabbitbrush. Atw - native. Compositae.

Clematis ligusticifolia Nutt. ex T. et G. Western Virgin's-Bower. (Nv). Scattered; mixed mountain shrub communities and moist gulches. Atw - native. Ranunculaceae.

Clematis columbiana (Nutt.) T. et G. Blue Clematis (Nv). Rare; sheltered gluches and steep forested north-facing slopes. Usually found on sites occupied by Douglas-fir. Atw - native. Ranunculaceae.

Ephedra viridis Coville. Mormon Tea. (M). Scattered; sandstone outcrops and cliff tops. Atw - native. Ephedraceae.

Eriogonum lonchophyllum T. et G. Wild Buckwheat. (N or Ch). Frequent; dry colluvial slopes and Indian ricegrass communities. Atw - native. Polygonaceae.

Eurotia lanata (Pursh) Moquin. See Ceratoides lanata.

Gutierrezia sarothrae (Pursh) Britt. et Rusby. Snakeweed. (Ch). Frequent; ridgetops and in chained pinyon-juniper woodlands. Atw - native. Compositae.

Holodiscus dumosus (Nutt.) Heller. Rock Spirea. (N). Very scattered; heads of draws and gulches, also along sheltered cliff bases on colluvial deposits. Atw - native. Rosaceae.

Humulus lupulus L. var. neomexicanus A. Nels. et Cockerell. Wild Hops. (Grh). Scattered; along permanent water courses (Piceance Creek) and irrigation ditches. Cst - native. Moraceae.

Juniperus osteosperma (Torr.) Little. Utah Juniper. (MM). Abundant; codominant species with pinyon pine in pinyon-juniper woodlands. More common than Rocky Mountain Juniper. Atw - native. Cupressaceae.

Juniperus scopulorum Sarg. Rocky Mountain Juniper. (MM). Relatively common; occurs as a secondary dominant with pinyon pine and Utah Juniper in pinyon-juniper woodlands. Atw - native. Cupressaceae.

Mahonia repens (Lindl.) G. Don. Oregon Grape. (Ch). Frequent; pinyon-juniper woodlands and mixed mountain shrub communities. Astw - native. Berberidaceae.

Opuntia polyacantha Haw. Prickly Pear. (S). Common; throughout the Tract in all communities. May reach greater density in overgrazed areas. Atw - native. Cactaceae.

Pinus edulis Engelm. Pinyon Pine. (MM). Abundant; dominant species in pinyon-juniper woodlands. Atw - native. Pinaceae.

Populus angustifolia James. Narrow-leaf Cottonwood. (MM). Rare; on Tract C-b restricted to Cottonwood Gulch. Not a rare species in Colorado, but rather one of the most widespread streamside cottonwood species. Atw - native. Salicaceae.

Prunus virginiana L. var. melanocarpa (A. Nels.) Sarg. Chokecherry. (M). Occasional; mixed mountain shrub communities and moist draws. Ast - native. Rosaceae.

Pseudotsuga menziesii (Mirbel) Franco. Douglas Fir. (MM). Scattered; restricted to narrow draws with sheltered north- and northeast-facing exposures. The largest tree species in the area. Astw - native. Pinaceae.

Purshia tridentata (Pursh) DC. Antelope Bitterbrush. (N). Common; mixed mountain shrub communities, shrub layer of pinyon-juniper woodlands, and chained pinyon-juniper woodlands. Atw - native. Rosaceae.

Quercus gambelii Nutt. Gambel Oak. (M). Frequent; mixed mountain shrub communities and heads of draws. Atw - native. Fagaceae.

Rhus trilobata Nutt. ex T. et G. Skunkbush. (N). Scattered; mixed mountain shrub communities. Atw - native. Anacardiaceae.

Ribes aureum Pursh. Golden Currant. (N). Scattered; along intermittent streams, draws, and gulches. Atw - native. Grossulariaceae.

Ribes cereum Dougl. Currant. (N). Scattered; along intermittent streams, draws, and gulches. Atw - native. Grossulariaceae.

Ribes inerme Rydb. Smooth Currant. (N). Scattered; along Piceance Creek and irrigation ditches. Astw - native. Grossulariaceae.

Rosa woodsii Lindl. Wild Rose. (N). Occasional; draws, gulches, and intermittent streams. Asw - native. Rosaceae.

Sarcobatus vermiculatus (Hook.) Torr. Greasewood. (M). Frequent; dense stands present on alluvial fans on the north side of Piceance Creek. Atw - native. Chenopodiaceae.

Shepherdia argentea (Pursh) Nutt. Silver Buffaloberry. (N). Rare; deep gulches along intermittent streams (Sorghum Gulch). Not a rare species in Colorado, but very restricted on C-b. Atw - native. Eleagnaceae.

Table B-3-2d (Continued)

Symphoricarpos oreophilus A. Gray. Snowberry. (N). Common; mixed mountain shrub communities, and as an understory component in pinyon-juniper woodlands. Atw - native. Caprifoliaceae.

Tetradymia canescens DC. Horsebrush. (N). Scattered; ridgetop sagebrush communities and chained pinyon-juniper woodlands. More common at higher elevations. Atw - native. Compositae.

Ulmus pumila L. Siberian Elm. (N). Rare; an introduced species much planted for shade. Only one small plant has been noted; an escapee from cultivation. Er - introduced. Ulmaceae.

HERBS

Achillea lanulosa Nutt. Yarrow. (Hsr). As - native. Compositae.

Agoseris glauca (Pursh) Raf. False Dandelion. (Hr). Relatively common; conspicuous in spring in pinyon-juniper woodlands. Atw - native. Compositae.

Agropyron smithii Rydb. Western Wheatgrass. (Grh). Relatively common; sagebrush communities and chained pinyon-juniper woodlands. Atw - native. Gramineae.

Agropyron desertorum (Fisch.) Schult. Crested Wheatgrass. (Hs). Relatively common; chained pinyon-juniper woodlands and other disturbed sites. This species is commonly seeded for range improvement. Er - introduced. Gramineae.

Agropyron spicatum (Pursh) Scribn. et Smith. Bluebunch Wheatgrass. (Hs). Frequent; dry colluvial slopes, Indian ricegrass communities, and pinyon-juniper woodlands. Atw - native. Gramineae.

(?) Agropyron trachycaulum (Link) Malte. Slender Wheatgrass. (Hs). As - native. Gramineae.

Agrostis gigantea Roth. Red Top. (Hsr). Frequent; irrigated pastures, along irrigation ditches and streams. Cs - native. Gramineae.

Amaranthus albus L. White Pigweed. (Th). Common; roadsides and disturbed sites. Atw - native. Amaranthaceae.

Amaranthus retroflexus L. Pigweed. (Th). Occasional; disturbed sites in all communities. Ta - introduced. Amaranthaceae.

Table B-3-2d (Continued)

Ambrosia artemisiifolia L. Ragweed. (Th). Frequent; roadsides, along streams, and on disturbed sites. At - native. Compositae.

Androsace septentrionalis L. Fairy Candelabra. (Th or short-lived Hr). Frequent; open slopes, sagebrush communities. Blooms in early spring. Ca - native. Primulaceae.

Anemone patens L. See *Pulsatilla patens* ssp. *multifida*.

Antennaria parvifolia Nutt. Pussytoes. (Chp). Frequent; pinyon-juniper and chained pinyon-juniper woodlands. As - native. Compositae.

Antennaria rosea Greene. Pussytoes. (Chp). Frequent; pinyon-juniper and chained pinyon-juniper woodlands. As - native. Compositae.

Apocynum androsaemifolium L. Spreading Dogbane. (Hp). Scattered; along intermittent streams in gulches and draws. As - native. Apocynaceae.

Arabis holboellii Hornem. Rock Cress. (Hs). Scattered; pinyon-juniper woodlands. Flowering in early May. As - native. Cruciferae.

Artemisia biennis Willd. Biennial Wormwood. (Hs). Occasional; sandy intermittent stream sides and dry channels. At - native. Compositae.

Artemisia dracunculus L. spp. *glauca* (Pallas) Hall et Clements. Green Sage. (Hs). Frequent; dry colluvial slopes and Indian ricegrass communities. Atw - native. Compositae.

Artemisia frigida Willd. Pasture Sage. (Hp or Ch). Frequent; dry colluvial slopes and Indian ricegrass communities. Cas - native. Compositae.

Artemisia ludoviciana Nutt. Sagewort. (Ch). Frequent; dry colluvial slopes and Indian ricegrass communities. At - native. Compositae.

Asclepias speciosa Torr. Showy Milkweed. (Grh). Atw - native. Asclepiadaceae.

(?) *Aster fendleri* A. Gray. Aster. (Hp). Atw - native. Compositae.

Aster frondosus (Nutt.) T. et G. See *Brachyactis frondosa*.

(?) *Aster glaucodes* Blake. Glaucous Aster. (Hp). Atw - native. Compositae.

Table B-3-2d (Continued)

Astragalus kentrophyta A. Gray. Kentrophyta Milk Vetch. (Hp). Frequent; exposed soil on steep slopes, weathered sandstone and disturbed sites. Atw - native. Leguminosae.

Balsamorhiza sagittata (Pursh) Nutt. Balsam Root. (Hr). Frequent; pinyon-juniper woodlands. Astw - native. Compositae.

Beckmannia syzigachne (Steud.) Fernald. Sloughgrass. (Th). Scattered; along Piceance Creek and possibly other more permanent water sources. As - native. Gramineae.

Bouteloua gracilis (H.B.K.) Lag. Blue Grama. (Hsr). Relatively common; pinyon-juniper and chained pinyon-juniper woodlands. Atw - native. Gramineae.

(?) *Brachyactis frondosa* (Nutt.) A. Gray. Short-rayed Alkali Aster. (Th). Atw - native. Compositae. (Syn. = *Aster frondosus*).

Brickellia grandiflora (Hook.) Nutt. Tassel Flower Brickellbrush. (Hs). Scattered; heads of draws and on colluvial deposits in gulches. Atw - native. Compositae.

(?) *Bromus porteri* (Coult.) Nash. Nodding Brome. (Hs). Scattered; along stream courses in dry gulches. Atw - native. Gramineae. (Syn. = *Bromus anomalus* Rupr. ex Fourn)

Bromus inermis Leyss. Smooth Brome. (Hsr). Scattered; along streams and irrigation ditches. Er - introduced. Gramineae.

Bromus japonicus Thunb. Japanese Brome. (Th). Scattered; chained pinyon-juniper woodlands and disturbed sites. Er - introduced. Gramineae.

Bromus tectorum L. Cheatgrass. (Th). Common; occurs in all communities, but is more frequent in sagebrush and valley floor communities. Ep - introduced. Gramineae.

Calochortus gunnisoni S. Wats. Mariposa Lily. (Gb). Rare; chained pinyon-juniper woodlands and ridgetop sagebrush communities. Atw - native. Liliaceae.

Calochortus nuttallii Torr. Mariposa Lily. (Gb). Frequent; ridgetop sagebrush communities. More common than the previous species. Atw - native. Liliaceae.

Calylophus hartwegii (Benth.) Raven ssp. *lavandulifolius* (T. et G.) Towner et Raven. Evening Primrose. (Hp). Occasional; chained pinyon-juniper woodlands. Atw - native. Onagraceae. (Syn. = *Oenothera lavandulaefolia*).

Table B-3-2d (Continued)

Camelina microcarpa Andrz. False Flax. (Th). Scattered; valley pastures and disturbed sites. Ep - introduced. Cruciferae.

Castilleja chromosa A. Nels. Indian Paintbrush. (Gp). Occasional; ridgetop sagebrush communities and chained pinyon-juniper woodlands. Atw - native. Scrophulariaceae.

Chenopodium fremontii S. Wats. Goosefoot. (Th). Occasional; chained pinyon-juniper woodlands and disturbed sites. Atw - native. Chenopodiaceae.

Chrysopsis villosa (Pursh) Nutt. ex DC. See *Heterotheca villosa*.

Cirsium arvense (L.) Scop. Canada Thistle. (Gr). Er - introduced. Compositae.

Clematis hirsutissima Pursh. Sugarbowls. (Hp). Rare; mixed mountain shrub communities on north-facing slopes. Not a rare species in Colorado, but known from only one location on C-b (Grid W66, N64). Atw - native. Ranunculaceae.

Cleome serrulata Pursh. Bee Plant. (Th). Common; roadsides, disturbed sites, and dry washes. Atw - native. Capparidaceae.

Comandra umbellata (L.) Nutt. spp. *pallida* (A.DC.) Piehl. Bastard Toadflax. (Grh). Frequent; chained pinyon-juniper and ridgetop sagebrush communities. Ast - native. Santalaceae.

Conyza canadensis (L.) Cronquist. Horseweed. (Th). Scattered; disturbed sites, and roadsides. Ast - native. Compositae.

Corydalis aurea Willd. Golden Smoke. (Hp). Occasional; steep sandy slopes and dry washes. As - native. Fumariaceae.

Dactylis glomerata L. Orchard Grass. (Hs). Scattered; pastures and hay meadows. Er - introduced. Gramineae.

Delphinium nelsoni Greene. Larkspur. (Grt). Occasional; ridgetop sagebrush communities and chained pinyon-juniper woodlands. Astw - native. Ranunculaceae.

Descurainia pinnata (Walt.) Britt. Tansy Mustard. (Th). Common; disturbed sites in all communities. A highly variable species, with 7 ssp. present in Colorado. Ast - native. Cruciferae.

Echinochloa crus-galli (L.) Beauv. var. *mitis* (Pursh) Peterm. Barnyard Grass. (Th). Scattered; disturbed sites in pastures, meadows, roadsides, and along streams. Er - introduced. Gramineae.

Table B-3-2d (Continued)

Elymus cinereus Scribn. et Merr. Great Basin Wildrye. (Hsr). Frequent; valley sagebrush communities and heads of draws. At one time this species was more widespread, but conversion of floodplains to irrigated hay meadows has reduced its abundance. Atw - native. Gramineae.

Epilobium sp. Fireweed. Onagraceae.

Equisetum arvense L. Horsetail. (Grh - life forms are usually not given for cryptogams). Occasional; along Piceance Creek and irrigation ditches. Ca - native. Equisetaceae.

(?) Equisetum hyemale L. Scouring Rush. (Grh - life forms are usually not given for cryptogams). Scattered; along Piceance Creek. Ast - native. Equisetaceae.

Equisetum kansanum Schaffner. See Equisetum laevigatum.

Equisetum laevigatum A. Br. Scouring Rush. (Grh - life forms are usually not given for cryptogams). Occasional; along Piceance Creek and other relatively permanent water bodies. Atw - native. Equisetaceae. (Syn. = Equisetum kansanum).

Erigeron utahensis A. Gray. Utah Daisy Fleabane. (Hp). Occasional; chained pinyon-juniper woodlands and ridgetop sagebrush communities. Atw - native. Compositae.

Eriogonum alatum Torr. Winged Eriogonum. (Hr). Occasional; pinyon-juniper woodlands and exposed outcrops. Atw - native. Polygonaceae.

Eriogonum cernuum Nutt. Nodding Eriogonum. (Th). Occasional; pastures, roadsides, and other disturbed sites. Astw - native. Polygonaceae.

(?) Eriogonum flexum M. E. Jones. Eriogonum. Scattered; disturbed sites and steep slopes. Atw - native. Polygonaceae.

Eriogonum umbellatum Torr. Sulphur Flower. (Hr). Scattered; mixed mountain shrub, more abundant on north-facing slopes. Atw - native. Polygonaceae.

Euphorbia robusta (Engelm.) Small. Spurge. (Hp). Scattered; dry colluvial slopes and Indian ricegrass communities. Atw - native. Euphorbiaceae.

Festuca brachyphylla Schultes. Sheep Fescue. (Hs). Occasional; pinyon-juniper woodlands and chained pinyon-juniper woodlands. Er - introduced. Gramineae.

Galium coloradoensis W. F. Wright. Colorado Bedstraw. (Hp). Scattered; steep dry colluvial slopes and Indian ricegrass communities. Atw - native. Rubiaceae.

Gayophytum ramosissimum T. et G. Much-branched Gayophytum. (Th). Scattered; along Piceance Creek and other relatively permanent water bodies. Atw - native. Onagraceae.

Gilia aggregata (Pursh) Spreng. See Ipomopsis aggregata.

Glycyrrhiza lepidota Pursh. Wild Licorice. (Hp). Frequent; along Piceance Creek and irrigation ditches. Atw - native. Leguminosae.

Haplopappus nuttallii T. et G. Goldenweed. (Hp). Occasional; pinyon-juniper and chained pinyon-juniper woodlands. Astw - native. Compositae.

Grindelia squarrosa (Pursh) Dunal. Curly-cup Gumweed. (Hp). Frequent; roadsides and other disturbed sites. Atw - native. Compositae.

Hedysarum boreale Nutt. Sweet Vetch. (Hp). Scattered; ridgetop sagebrush communities and chained pinyon-juniper woodlands. Asa - native. Leguminosae.

Helianthus annuus L. Common Sunflower. (Th). Frequent; roadsides and disturbed sites. Atw - native. Compositae.

Helianthus nuttallii T. et G. Nuttall's Sunflower. (Hp). Occasional; along Piceance Creek and irrigation ditches. Atw - native. Compositae.

Heterotheca villosa (Pursh) Shinners. Golden Aster. (Hp). Relatively common; present in most communities on C-b but is uncommon in valley sagebrush communities. Atw - native. Compositae. (Syn. = Chrysopsis villosa).

Heuchera parvifolia Nutt. ex T. et G. Alumroot. (Hr). Occasional; mixed mountain shrub communities and draws and gulches. Astw - native. Saxifragaceae.

Hordeum jubatum L. Foxtail Barley. (Hs). Occasional; valley sagebrush communities and moist meadows. Asa - native. Gramineae.

Ipomopsis aggregata (Pursh) V. Grant. Scarlet Gilia. (Hs). Relatively common; roadsides, dry washes, and pinyon-juniper woodlands. Atw - native. Polemoniaceae. (Syn. = Gilia aggregata).

Iva xanthifolia Nutt. Marsh Elder. (Th). Common; along Piceance Creek and irrigation ditches. Atw - native. Compositae.

Juncus arcticus Willd. spp. ater (Rydb.) Hulten. Baltic Rush. (Grh). Scattered; marshes and along Piceance Creek and irrigation ditches. As - native. Juncaceae. (Syn. = Juncus balticus).

Juncus balticus Willd. See Juncus arcticus spp. ater.

Koeleria cristata (L.) Pers. See Koeleria gracilis.

Koeleria gracilis Pers. Junegrass. (Hs). Relatively common; ridgetop sagebrush communities and chained pinyon-juniper woodlands. Ct - native. Gramineae. (Syn. = Koeleria cristata).

Lactuca pulchella (Pursh) DC. See Lactuca tatarica spp. pulchella.

Lactuca serriola L. Prickly Lettuce. (Th). Occasional; roadsides and disturbed sites. Ep - introduced. Compositae. (Syn. = Lactuca scariola).

Lactuca tatarica (L.) C. A. May spp. pulchella (Pursh) Stebbins. Blue Lettuce. (Hs). Scattered; mixed mountain shrub communities and rarely along roadsides. As - native. Compositae. (Syn = Lactuca pulchella).

Lappula redowskii (Hornem.) Greene. Stickseed. (Th). Relatively common; pastures, valley sagebrush communities, and chained pinyon-juniper woodlands. Asw - native. Boraginaceae.

Lepidium montanum Nutt. Mountain Peppergrass. (Hs). Common; valley sagebrush communities, disturbed sites, and occasionally in mixed mountain shrub communities. Atw - native. Cruciferae.

Lepidium perfoliatum L. Peppergrass. (Th). Frequent; pastures and heavily grazed sites. Ep - introduced. Cruciferae.

Linum lewisii Pursh. Wild Flax. (Hp). Frequent; dry colluvial slopes and Indian ricegrass communities. Aa - native. Linaceae.

Lolium perenne L. Darnel. (Hs). Relatively rare; disturbed sites. A species introduced in the area; possibly mixed with other grass seed. Ep - introduced. Gramineae.

Lupinus argenteus Pursh. Lupine. (Hp). Relatively common; upland sagebrush communities. Atw - native. Leguminosae.

Medicago sativa L. Alfalfa. (Hp). Abundant; this species is planted as a hay crop in the meadows along Piceance Creek, Willow Creek, and Stewart Creek. Er - introduced. Leguminosae.

Melilotus alba Desr. White Sweet Clover. (Hs). Frequent; along streams and dry washes. Occasionally along roadsides. Ep - introduced. Leguminosae.

Melilotus officinalis (L.) Lam. Yellow Sweet Clover. (Hs). Frequent; along streams and dry washes, occasionally along roadsides. Ep - introduced. Leguminosae.

Mentzelia rusbyi Wooton. Evening Star. (Grt). Occasional; dry colluvial slopes and roadsides. Atw - native. Loasaceae. (Syn. = Mentzelia nuda var. rusbyi).

Mirabilis linearis (Pursh) Heimerl. See Oxybaphus linearis.

Nasturtium officinale R. Br. See Rorippa pasturtium-aquaticum.

Oenothera caespitosa Nutt. ex Fraser. Gumbo Lily. (Hr). Occasional; steep roadsides and disturbed sites. Atw - native. Onagraceae.

Oenothera lavandulaefolia T. et G. See Calylophus hartwegii ssp. lavandulifolius.

Oenothera strigosa (Rydb.) Mack et Bush. Yellow Evening Primrose. (Hs). Scattered; along Piceance Creek and other moist areas. At - native. Onagraceae.

Oenothera trichocalyx Nutt. ex T. et G. Evening Primrose. (Hs). Rare; dry washes and alluvial deposits. Atw - native. Onagraceae.

Onosmodium molle Michx. var. occidentalis (Mack.) Johnston. False Gromwell. (Hs). Scattered; roadsides and dry slopes. At - native. Boraginaceae.

Oryzopsis hymenoides (R. et S.) Ricker. Indian Ricegrass. (Hs). Common; dry colluvial slopes and chained pinyon-juniper woodlands. Atw - native. Gramineae.

Oryzopsis micrantha (Trin. et Rpr.) Thurber. Little Ricegrass. (Hs). Scattered; pinyon-juniper woodlands and valley sagebrush communities. Atw - native. Gramineae.

Table B-3-2d (Continued)

Oxybaphus linearis (Pursh) Robbins. Umbrellawort. (Hp). Scattered; sandy ridges and slopes. Atw - native. Nyctaginaceae. (Syn. = Mirabilis linearis).

(?) Phacelia idahoensis Henderson. Phacelia. (Hp). Occasional; pinyon-juniper woodlands and roadsides. Atw - native. Hydrophyllaceae.

Phleum pratense L. Timothy. (Hs). Frequent; hay meadows and pastures. Er - introduced. Gramineae.

Phlox hoodii Rich. Moss Phlox. (Chcp). Common; pinyon-juniper woodlands, ridgetop sagebrush communities, and chained pinyon-juniper woodlands. Asw - native. Polemoniaceae.

Phlox longifolia Nutt. Long-leaved Phlox. (Hp). Frequent; ridgetop sagebrush communities and chained pinyon-juniper woodlands. Atw - native. Polemoniaceae.

Phragmites australis (Cav.) Trin. ex Steud. Common Reed. (Hsr). Common; marshes and along Piceance Creek. Restricted to wet environments. Cst - native. Gramineae. (Syn. = Phragmites communis).

Phragmites communis Trin. See Phragmites australis.

Physaria floribunda Rydb. Double Bladderpod. (Hr). Frequent; steep slopes, dry washes, and pinyon-juniper woodlands. Atw - native. Cruciferae.

Poa fendleriana (Steud.) Vasey. Muttongrass. (Hs). Scattered; ridgetop sagebrush communities and chained pinyon-juniper woodlands. Atw - native. Gramineae.

Poa pratensis L. Kentucky Bluegrass. (Grh). Frequent; meadows, pastures, and along streams and irrigation ditches. Cas - introduced. Gramineae.

Polypogon monspeliensis (L.) Desf. Rabbit's-foot Grass. (Th). Scattered; along streams and irrigation ditches. Ep - introduced. Gramineae.

(?) Potentilla gracilis Dougl. ex Hook. Cinquefoil. (Hs). Relatively rare; sheltered gulches along rocky intermittent streams. Asw - native. Rosaceae.

Table B-3-2d (Continued)

Pulsatilla patens (L.) Mill. spp. multifida (Pritzel) Zamels. Pasque Flower. (Hs). Rare; north-facing mountain shrub communities. Not rare in Colorado, but very restricted on Tract C-b. Ca-native. Ranunculaceae.

Ranunculus cymbalaria Pursh. Shore Buttercup. (Hsr). Scattered; wet sandy and streamside deposits along Piceance Creek. Ca - native. Ranunculaceae.

Rorippa nasturtium-aquaticum (L.) Schinz et Thell. Watercress. (HH). Scattered; in streams and shallow water, Stewart Creek. Ep - introduced. Cruciferae. (Syn. = Nasturtium officinale).

Rumex sp. Dock. Polygonaceae.

Salsola iberica Sennen et Pau. Russian Thistle. (Th). Common; roadsides and disturbed sites. Er - introduced. Chenopodiaceae. (Syn. = Salsola kali var. tenuiflora).

Salsola kali L. var. tenuiflora Tausch. See Salsola iberica.

Scirpus lacustris L. ssp. validus (Vahl) Koyama. Tule. (Grh). Scattered; along Piceance Creek and other relatively permanent streams. As - native. Cyperaceae. (Syn. = Scirpus validus).

Scirpus paludosus A. Nels. Prairie Bulrush. (Grh). Scattered; along Piceance Creek and other relatively permanent streams. Astw - native. Cyperaceae.

Scirpus validus Vahl. See Scirpus lacustris spp. validus.

Senecio eremophilus Rydb. var. kingii (Rydb.) Greenm. Ragwort. (Hp). Occasional; chained pinyon-juniper woodlands. Atw - native. Compositae.

Senecio multilobatus T. et G. ex A. Gray. Golden Ragwort. (Grh). Occasional; pinyon-juniper and chained pinyon-juniper woodlands. Atw - native. Compositae.

Sidalcea neomexicana A. Gray. Checker Mallow. (Hp). Occasional; hay meadows and pastures along Piceance Creek. Atw - native. Malvaceae.

Sisymbrium altissimum L. Tumble Mustard. (Th). Relatively common; chained pinyon-juniper woodlands and disturbed sites. Ep - introduced. Cruciferae.

Table B-3-2d (Continued)

Sitanion hystrix (Nutt.) J. G. Smith. See Sitanion longifolium.

Sitanion longifolium J. G. Smith. Squirreltail Grass. (Hs). Frequent; sagebrush communities and chained pinyon-juniper woodlands. Atw - native. Gramineae. (Syn. = Sitanion hystrix).

Smilacina stellata (L.) Desf. False Solomon's Seal. (Grh). Relatively rare; Douglas-fir forests. As - native. Liliaceae.

Solidago canadensis L. Meadow Goldenrod. (Hsr). Scattered; along Piceance Creek. Ast - native. Compositae.

(?) Solidago sparsiflora A. Gray. Goldenrod. (Hsr). Scattered; along intermittent streams in draws and gulches. Atw - native. Compositae.

(?) Sonchus arvensis L. Sow Thistle. (Hsr). Scattered; meadows and pastures along Piceance Creek. Ep - introduced. Compositae.

Sphaeralcea coccinea (Pursh) Rydb. Scarlet Globe Mallow. (Hp). Common; ridgetop sagebrush communities and chained pinyon-juniper woodlands. Atw - native. Malvaceae.

(?) Sporobolus cryptandrus (Torr.) A. Gray. Sand Dropseed. (Hsr). Scattered; roadsides and sandy alluvial deposits. At - native. Gramineae.

Stipa comata Trin. et Rupr. Needle-and-Thread Grass. (Hs). Frequent; sagebrush communities and chained pinyon-juniper woodlands. Astw - native. Gramineae.

Streptanthus cordatus Nutt. ex T. et G. Twistflower. (Hs). Scattered; pinyon-juniper woodlands and chained pinyon-juniper woodlands. Atw - native. Cruciferae.

Taraxacum officinale Web. in Wiggers. Dandelion. (Hr). Frequent; roadsides and disturbed sites. Er - introduced. Compositae.

Townsendia hookeri Beaman. Easter Daisy. (Hr). Frequent; ridgetop sagebrush communities, pinyon-juniper and chained pinyon-juniper woodlands. Atw - native. Compositae.

Townsendia incana Nutt. Easter Daisy. (Hr). Scattered; ridgetop sagebrush communities and chained pinyon-juniper woodlands. Atw - native. Compositae.

Table B-3-2d (Continued)

Tragopogon dubius Scop. Goat's Beard. (Hs). Occasional; ridgetop sagebrush communities and chained pinyon-juniper woodlands. Ep - introduced. Compositae.

Trifolium gymnocarpon Nutt. Clover. (Hs). Relatively rare; pinyon-juniper woodlands and mixed mountain shrub communities. Atw - native. Leguminosae.

Triglochin maritima L. Seaside Arrowgrass. (Hr). Relatively rare; marshes and moist meadows along Piceance Creek and other streams. Cas - native. Juncaginaceae.

Tripterocalyx micranthus (Torr.) Hook. Wing-fruited Sand Verbena. (Th). Rare; sandy alluvial deposits. Atw - native. Nyctaginaceae.

Typha latifolia L. Cattail. (HH). Frequent; marshes and streamsides. Restricted to wet environments. As - native. Typhaceae.

Urtica dioica L. Stinging Nettle. (Hpr). Scattered; moist meadows in draws and gulches. As - native. Urticaceae.

Veronica salina Schur. Speedwell. (Hp). Scattered; streamside sites along Piceance Creek. Ct - native. Scrophulariaceae.

Yucca glauca Nutt. Yucca. (Hr). Occasional; chained pinyon-juniper woodlands. Atw - native. Liliaceae.

Zigadenus venenosus S. Wats. var. gramineus (Rydb.) Walsh ex M. E. Peck. Death Camas. (Gb). Scattered; ridgetop sagebrush communities and chained pinyon-juniper woodlands. Atw - native. Liliaceae.

Table B-3-2e ADDENDA TO THE ANNOTATED VASCULAR FLORA FOR TRACT C-b

SHRUBS

Amelanchier utahensis Koehne. Utah Serviceberry. (M). Common; a major species in chained rangelands and mixed mountain shrublands. Atw-native. Rosaceae.

Salix exigua Nutt. Willow. (M). Scattered; moist sites in gulches and along Piceance Creek. Asw-native. Salicaceae.

HERBS

Allium acuminatum Hook. (Gb). Wild Onion. Rare; upland sagebrush communities. Atw-native. Lilaceae.

Anaphalis margaritacea (L.) Benth. et Hook. (Hs) Pearly Everlasting. Relatively rare; mixed mountain shrublands. Ast-Native. Compositae.

Aster adscendens Lindl. in DC. (Hp). Aster. Scattered; mixed mountain shrublands. Atw-native. Compositae.

Astragalus ceramicus Sheld. (Hp). Milkvetch. Occasional; chained rangelands and pinyon-juniper woodlands. Atw-Native. Leguminosae.

Astragalus diversifolius A. Gray. (Hp). Milkvetch. Occasional; upland sagebrush communities, chained rangelands and pinyon-juniper woodlands. Atw-Native. Leguminosae.

Astragalus purshii Dougl. ex Hook. (Hp). Pursh's Milkvetch. Occasional; chained rangelands, pinyon-juniper woodlands and upland sagebrush communities. Astw-native. Leguminosae.

Astragalus scopulorum Porter (Hp). Milkvetch. Scattered; chained rangelands, pinyon-juniper woodlands and upland sagebrush communities. Atw-Native. Leguminosae.

Astragalus spatulatus Sheld. Milkvetch. (Hp). Occasional; upland sagebrush communities and chained rangelands. Astw-native. Leguminosae.

Bromus marginatus Nees. Mountain Brome (Hp). Scattered; mixed mountain shrublands. Atw-native. Gramineae.

Carex aquatilis Wahlenb. spp. *aquatilis*. Sedge. (Grh). Occasional; in wet areas along streams. Cas-native. Cyperaceae.

Table B-3-2e (Continued)

HERBS (cont.)

Carex atherodes Spreng. Sedge. (Grh). Scattered; wet areas along Willow and Piceance Creeks. Cs-native. Cyperaceae.

Carex heliophila Mack. Sedge. (Grh). Frequent; chained rangelands, pinyon-juniper woodlands and upland sagebrush communities. At-native. Cyperaceae.

Carex lanuginosa Michx. Sedge. (Grh). Scattered; wet areas along streams. Ast-native. Cyperaceae.

Carex simulata Mack. Sedge. (Grh). Scattered; wet areas along streams. Atw-native. Cyperaceae.

Chaenactis douglasii (Hook.) Hook. et Arn. False Yarrow. (Hs). Occasional; chained rangelands and pinyon-juniper woodlands. Atw-native. Compositae.

Chamaesyce glyptosperma (Engelm.) Small. Spurge. (Th). Occasional; disturbed sites in chained rangelands. At-native. Euphorbiaceae.

Chenopodium album L. Goosefoot. (Th). Relatively common; chained rangelands, sagebrush communities and disturbed sites. This species occurs most commonly as small individuals. Er-introduced. Chenopodiaceae.

Chorispora tenella (Pallas) DC. Chorispora. (Th). Occasional; roadsides and disturbed sites. Er-introduced. Cruciferae.

Collinsia parviflora Dougl. in Lindl. Baby Blue Eyes. (Th). Occasional; chained rangelands, pinyon-juniper woodlands, and upland sagebrush communities. More common in moist years. Ast-native. Scrophulariaceae.

Collomia linearis Nutt. Collomia. (Th). Scattered; chained rangelands and upland sagebrush commmunities. At-native. Polemoniaceae.

Crepis acuminata Nutt. Hawks beard. (Hs). Relatively common; upland sagebrush communities, chained rangelands and pinyon-juniper woodlands. Atw-native. Compositae.

Cryptantha sericea (A. Gray) Payson. Cryptantha. (Hs). Scattered; pinyon-juniper woodlands and chained rangelands. Atw-native: Boraginaceae.

Table B-3-2e (Continued)

HERBS (cont.)

Cryptantha sp. Payson. Cryptantha. (Hs). Rare; pinyon-juniper woodlands. Atw-native. Boraginaceae.

Draba reptans (Lam.) Fernald. White Draba. (Th). Relatively rare; chained rangelands and pinyon-juniper woodlands. Atw-native. Cruciferae.

Eleocharis macrostachya Britt. Spikerush. (Grh). Relatively common; wet areas along Willow and Piceance Creeks. Cs-native. Cyperaceae.

(?) Erigeron aphanactis (A Gray) Greene. Daisy Fleabane. (Hs). Scattered; chained rangelands. Atw-native. Compositae.

Erigeron nematophyllus Rydb. Daisy Fleabane. (Hs). Relatively common; chained rangelands, upland sagebrush communities and pinyon-juniper woodlands. Atw-native. Compositae.

(?) Erigeron pumilus Nutt. Daisy Fleabane. (Hs). Scattered; chained rangelands and pinyon-juniper woodlands. Atw-native. Compositae.

Eriogonum ovalifolium Nutt. var. ovalifolium. Wild Buckwheat. (Chcp). Relatively rare; pinyon-juniper woodlands and chained rangelands. Atw-native. Polygonaceae.

Erysimum asperum (Nutt.) DC. Western Wallflower. (Hs). Occasional; pinyon-juniper woodlands and chained rangelands. Atw-native. Cruciferae.

Haplopappus acaulis (Nutt.) A. Gray. Goldenweed. (Cha). Scattered; chained rangelands and pinyon-juniper woodlands. Atw-native. Compositae.

Hedeoma drummondii Benth. False Pennyroyal. (Hp). Rare; sandstone outcrops in pinyon-juniper woodlands. Atw-native. Labiatae.

Hippuris vulgaris L. Marestail. (HH). Rare; ponds, streams and marshes. Ca-native. Haloragidaceae.

Hymenopappus filifolius Hook. var. luteus (Nutt.) B. L. Turner. Hymenopappus. (Hs). Scattered; pinyon-juniper woodlands and chained rangelands. Atw-native. Compositae.

Table B-3-2e (Continued)

HERBS (cont.)

Hymenoxis acaulis (Pursh) Parker. Actinea. (Hr). Scattered; pinyon-juniper woodlands and chained rangelands. Asw-native. Compositae.

Kochia iranica. Bornm. Summer-Cypress. (Th). Occasional; roadsides and disturbed sites. Er-introduced. Chenopodiaceae.

Leptodactylon pungens (Torr.) Rydb. Prickly Gilia. (Chp). Scattered; pinyon-juniper woodlands and chained rangelands. Atw-native. Polemoniaceae.

Lithospermum incisum Lehm. Puccoon. (Hp). Scattered; mixed mountain shrublands. At-native. Boraginaceae.

Lithospermum ruderale Dougl. in Lehm. Puccoon. (Hp). Scattered; chained rangelands. Atw-native. Boraginaceae.

Lomatium orientale C. et R. Biscuitroot. (Grt). Relatively common; upland sagebrush communities, pinyon-juniper woodlands and chained rangelands. Atw-native. Umbelliferae.

Marrubium vulgare L. Horehound. (Hs). Scattered; chained rangelands. Ep-introduced. Labiatae.

Mentzelia dispersa S. Wats. Mentzelia. (Th). Occasional; chained rangelands and disturbed sites. Atw-native. Loasaceae.

(?) Microseris cuspidata (Pursh) Schultz-Bip. Microseris. (Hr). Scattered; chained rangelands. Atw-native. Compositae.

Microsteris gracilis (Dougl. ex Hook.) Greene spp. humilis (Greene) V. Grant. Microsteris. (Th). Relatively common; upland sagebrush communities, pinyon-juniper woodlands, and chained rangelands. More common in moist years. Atw-native. Polemoniaceae. [Syn = Microsteris micrantha (Kellogg) Greene].

Nicotiana attenuata Torr. ex S. Wats. Tobacco. (Th). Occasional; roadsides and disturbed sites. Atw-native. Solonaceae.

Orobanche fasciculata Nutt. Cancer root. (Gp). Scattered; upland sagebrush communities. Root parasite on big sagebrush. Ast-native. Orobanchaceae.

Penstemon caespitosus Nutt. ex A. Gray. Beard tongue. (Hp). Scattered; upland sagebrush communities and chained rangelands. Atw-native. Scrophulariaceae.

Table B-3-2e (Continued)

HERBS (cont.)

Penstemon fremontii T. et G. Beard tongue. (Hs). Occasional; upland sagebrush communities, pinyon-juniper woodlands and chained rangelands. Atw-native. Scrophulariaceae.

Penstemon lentus Pennell Beard tongue. (Hs). Scattered; chained rangelands and bunchgrass communities. Atw-native. Scrophylariaceae.

Penstemon watsonii A. Gray Beard tongue. (Hp). Scattered; mixed mountain shrublands. Atw-native. Scrophulariaceae.

Poa arida Vasey. Bluegrass. (Hs). Occasional; pinyon-juniper woodlands. Astw-native. Gramineae.

Polygonum douglasii Greene. Knotweed. (Th). Scattered; chained rangelands and upland sagebrush communities. At-native. Polygonaceae.

Polygonum sawatchense Small. Knotweed. (Th). Occasional; chained rangelands and upland sagebrush communities. These diminutive plants are easily over-looked. Atw-native. Polygonaceae.

Ranunculus glaberrimus Hook. Sagebrush Buttercup. (Hs). Rare; mixed mountain shrublands and upland sagebrush communities. Atw-native. Ranunculaceae.

Sisymbrium officinale (L.) Scop. Tumble Mustard. (Th). Scattered; disturbed sites in chained rangelands. Ep-introduced. Cruciferae.

Stephanomeria tenuifolia (Torr.) H. M. Hall. Stephanomeria. (Grt). Scattered; pinyon-juniper woodlands. Atw-native. Compositae.

Viola nuttallii Pursh. Nuttall's Yellow Violet. (Hs). Rare; bottomland sagebrush communities. Atw-native. Violaceae.

Castilleja linariaefolia Benth. in DC. Indian Paintbrush. (Gp). Frequent; ridgetop sagebrush communities and chained pinyon-juniper woodlands. Atw - native. Scrophulariaceae.

Cirsium sp. Thistle. Compositae.

Table B-3-3 TREE DATA SUMMARIES FOR THREE STANDS OF PINYON-JUNIPER WOODLAND VEGETATION

	Frequency (percent)	Density (Trees/Acre)	Density (Trees/Hectare)	Basal Area (in^2/Acre)	Basal Area (m^2/Hectare)
Stand 9					
Juniperus osteosperma	95	28	69	4284	6.8
Juniperus scopulorum	77.5	20	49	2360	3.7
Pinus edulis	60	17	42	1581	2.5
Total		65	160	8225	13.0
Stand 13					
Juniperus osteosperma	62.5	18	44	2898	4.6
Juniperus scopulorum	62.5	27	67	3078	4.9
Pinus edulis	87.5	41	101	6847	10.9
Quercus gambelii	2.5	1	2	16	0.02
Total		87	214	12839	20.42
Stand 12					
Juniperus osteosperma	5	1	2	82	0.1
Pinus edulis	100	104	257	4731	7.5
Total		105	259	4813	7.6

Table B-3-4 STRUCTURAL AND COMPOSITIONAL SUMMARY[1] FOR THE SHRUB LAYER IN A PINYON-JUNIPER WOODLAND - STAND 9

Species	Cover (percent)	Frequency (percent)	No./ Hectare	Importance Value[2]	Rank
Artemisia tridentata	1.8	35	395	49.8	2
Cercocarpus montanus	<0.1	5	18	2.3	9
Chrysothamnus viscidiflorus	0.6	10	126	15.8	5
Juniperus osteosperma	0.2	25	108	14.8	6
J. scopulorum	<0.1	10	36	4.6	8
Opuntia polyacantha	<0.1	35	251	19.4	4
Pinus edulis	0.6	60	448	41.8	3
Purshia tridentata	3.6	90	2,206	145.6	1
Symphoricarpos oreophilus	0.1	10	54	5.8	7
Totals	7.2		3,642		

Table B-3-5 STRUCTURAL AND COMPOSITIONAL SUMMARY[3] FOR THE SHRUB LAYER IN A PINYON-JUNIPER WOODLAND - STAND 12

Species	Cover (percent)	Frequency (percent)	No./ Hectare	Importance Value[2]	Rank
Amelanchier spp.	1.6	45	511	35.0	4
Artemisia tridentata	3.5	95	4,545	113.1	1
Chrysothamnus viscidiflorus	0.3	85	2,151	46.6	3
Juniperus osteosperma	0.5	5	27	7.5	7
Opuntia polyacantha	0.1	65	1,050	28.3	5
Pinus edulis	2.1	65	860	49.6	2
Purshia tridentata	0.2	10	82	5.7	8
Symphoricarpos oreophilus	0.2	35	296	14.2	6
Totals	8.5		9,522		

[1] Values based on observations in 20 6x50 foot belt transects

[2] Importance value = relative cover + relative frequency + relative humidity

[3] Values based on observations in 20 4x50 foot belt transects

Table B-3-6 PERCENT FREQUENCY OF HERBACEOUS PLANTS IN SAMPLED STANDS 7-20 (VALUES BASED ON 20 1.0 m^2 QUADRATS)

Species	Stand Number 7	8	9	10	11	12	13	14	15	16	17	18	19	20
Agoseris glauca		5		5	10				20					
Agropyron cristatum												100		
Agropyron dasystachyum								25						
Agropyron desertorum	5	20	10	40	5						15	10		
Agropyron smithii	85	80	80	55	100	80	60	55	100	70	95	55	10	10
Agropyron trachycaulum				10						10	5			10
Allium acuminatum									15					
Androsace septentrionalis				10			35			5				
Antennaria parvifolia	15	25	5	15			10	20						
Antennaria rosea			5			5	25	20						
Arabis holboellii			5		10	20	15	15	20					
Artemisia dracunculus											20			10
Artemisia frigida														40
Artemisia ludoviciana	5						5			65	10		30	
Aster adscendens							5							
Aster fendleri (?)								40						
Aster sp.	5	5		10										
Astragalus ceramicus		45	25		25		10				15	20		5
Astragalus diversifolius	5	5		25					10					
Astragalus purshii	15					10			15					
Astragalus scopulorum									30					
Astragalus spatulatus				20				30						
Balsamorhiza sagittata						20		5	15					
Bouteloua gracilis				10						20				

Table B-3-6 (Continued)

Species	Stand Number 7	8	9	10	11	12	13	14	15	16	17	18	19	20
Brickellia grandiflora														60
Bromus inermis											30			
Bromus marginatus							15							
Bromus tectorum	20	10	10			25	10	55		100	95	75	100	35
Calochortus nuttallii	5				15	15			35					
Carex sp.				45		35								
Carex pensylvanica (?)	40	35	40		50	55		15	45					
Castilleja chromosa		5			65				55					
Chaenactis douglasii				15					5					
Chenopodium album	40		15		25	10		20	25					15
Chenopodium sp.			20							55	55	20	25	
Cirsium sp.			10				5							15
Cleome serrulata											5			
Collinsia parviflora	15				5	10			85					
Collomia linearis									40					
Commandra umbellata		5	35	20	5	10	10		30					
Crepis acuminatus	5	15	10		35	60	5	30	80					
Cryptantha sp.	5			10			10	20						
Delphinium nelsoni	5													
Descurainia pinnata	15	5	10	5			10			15	15	10		
Elymus cinereus												25		
Erigeron aphanactus (?)			5											
Erigeron filifolius (?)				5										
Erigeron pumila (?)							5							
Erigeron nematophyllus	50					70	5	35	100					25
Erigeron utahensis	5	70	20	10	55		5					10		

Table B-3-6 (Continued)

Species	Stand Number 7	8	9	10	11	12	13	14	15	16	17	18	19	20
Eriogonum alatum			40	40	5		10							
Eriogonum heracleoides			30											
Eriogonum lonchophyllum	5		20	30			10							55
Eriogonum strictum (?)					20									
Eriogonum umbellatum			15	5			5		10					
Erysimum asperum				5		5								
Euphorbia robusta				5			5							
Festuca brachyphylla (?)	45	15			25	85		45	75					
Gayophytum ramocissimum	5					5			5					
Haplopappus nuttallii		20	90	85			5	30						
Hedysarum boreale	5			5	25			5	10					
Heterotheca villosa	5							30						
Heuchera parvifolia								5						
Hymenopappus filifolius			55	5										
Hymenoxis acaulis				20										
Ipomopsis aggregata		5		30		10	10	5					5	
Kochia iranica											10	25		
Koeleria gracilis	55	90	30	40	100	65	45	50	100					
Lactuca serriola						5								
Lappula redowskii	30						5			40	50			
Lepidium montanum			40							40	100	5	50	
Linum lewisii				5										
Lithospermum sp.				10										
Lomatium foeniculaceum						5			30					
Lupinus argenteus	10					10	15		25					
Marrubium vulgare												5		
Mentzelia dispersa	10			15										

Table B-3-6 (Continued)

Species	Stand Number													
	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Microseris cuspidata	10	15	5											
Microsteris micrantha	5					45			90					
Oenothera caespitosa			10	20			5							30
Orobanche fasciculata		5		5										
Oryzopsis hymenoides	50	30	45	40	75		35	55		5			45	90
Oryzopsis micrantha							5							
Penstemon fremontii		5			10									
Penstemon lentus									5					
Penstemon sp.				5										15
Phlox hoodii	70	85	35	60	70	45	25	25						
Phlox longifolia		30	5	15	10	55	5		100					
Physaria floribunda			30	85			15	5	35					
Poa fendleriana				25			50							
Poa pratensis							10							
Poa sp.	10	45	15							25	75			
Polygonum rurivagum	10													
Polygonum sawatchense						50			95					
Polygonum sp.		10			25									
Salsola kali										5	5			30
Senecio fremontii (?)				15										
Senecio multilobatus	15	15		5	15		30	5						
Senecio sp.			10				5							
Sisymbrium altissimum			5											
Sisymbrium sp.	10													
Sitanion longifolium	25		5			15	10	35		5				
Sphaeralcea coccinea		15		5	95	20	5	20	40	25	5		5	
Sporobolus cryptandrus										40			35	

Table B-3-6 (Continued)

Species	Stand Number 7	8	9	10	11	12	13	14	15	16	17	18	19	20
Stephanomeria tenuifolia				40				5						
Stipa comata	50	25	20	50	30	70	50		65	80				
Streptanthus cordatus							5							
Taraxacum officinale						15		15						
Townsendia sericea	5	35		15				10						
Tragopogon dubius	5					5								
Trifolium gymnocarpon	5								95					
Zygadenus venenosus			5											
Unknown mustard			5											
Non-Herbaceous Species <25cm in height														
Amelanchier spp.					5			10	5					
Artemisia tridentata	20	50		15		10			85	20			20	
Atriplex confertifolia														60
Cercocarpus montanus	5													
Chrysothamnus nauseosus									5	20	5	5		
Chrysothamnus viscidiflorus	10					5	20		60					
Gutierrezia sarothrae	15	65	15	50	40		5	40						
Juniperus scopulorum							5							
Mahonia repens			5											
Opuntia polyacantha	5	5				5			10					
Pinus edulis		5				15	5	5						
Purshia tridentata	5				10									
Quercus gambelii				5			5							
Sarcobatus vermiculatus												15		
Symphoricarpos oreophilus	25					5	15	5	5					
Tetradymia canescens					70	10		5						

Table B-3-7 SUMMARY OF HERB AND WOODY COVER[1] (<25 cm) IN THE HERB LAYER AND GROUND LAYER SUMMARY FOR STANDS 7-20

	Stand Number													
	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Mean Herb Cover	42	46	22	38	63	20	26	36	43	27	51	43	17	29
Mean Woody Cover	1	2	<1		1	<1		2	4	3	2	2	4	
Mean Moss Cover	1	1	<1		1	<1	3	<1	2	1	5			
Mean Cover-Crustose Lichen			<1			<1								
Mean Cover-Foliose-Fruticose Lichen				5	1		2		<1					
Mean Litter Cover	71	69	48	57	81	81	72	72	66	77	80	76	77	35
Mean Cover-Bare Soil	26	31	33	41	19	18	22	28	32	20	13	21	18	42
Mean Cover-Rock	1	2	18	3	1	<1	2	<1	<1		1		1	13

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[1] Values based on 20 1.0 m^2 quadrats

Table B-3-8 STRUCTURAL AND COMPOSITIONAL SUMMARY[1] FOR THE SHRUB LAYER IN A PINYON-JUNIPER WOODLAND - STAND 13

Species	Cover (percent)	Frequency (percent)	No./ Hectare	Importance Value[2]	Rank
Amelanchier spp.	3.5	45	2,421	34.2	3
Artemisia tridentata	1.1	35	646	14.9	7
Cercocarpus montanus	1.8	60	1,022	24.9	4
Chrysothamnus nauseosus	0.1	20	90	4.9	11
C. viscidiflorus	0.9	45	520	15.7	6
Juniperus osteosperma	0.2	15	54	4.1	12
J. scopulorum	0.1	30	161	7.4	9
Pinus edulis	0.6	35	197	11.0	8
Purshia tridentata	2.3	45	1,022	23.5	5
Quercus gambelii	4.4	25	4,477	41.7	2
Ribes inerme	0.2	15	287	5.3	10
Rosa woodsii	0.1	5	304	2.5	13
Symphoricarpos oreophilus	9.0	85	14,489	113.9	1
Totals	24.3		25,661		

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[1] Values based on 20 6 x 50 foot belt transects

[2] Importance value = relative cover + relative density + relative frequency

Table B-3-9 STRUCTURAL AND COMPOSITIONAL SUMMARY[1] FOR THE SHRUB LAYER IN A CHAINED RANGELAND COMMUNITY - STAND 10

Species	Cover (percent)	Frequency (percent)	No./ Hectare	Importance Value[2]	Rank
Amelanchier spp.	0.1	15	179	9.9	5
Artemisia tridentata	3.8	60	3,658	124.5	1
Chrysothamnus nauseosus	0.4	10	72	9.0	7
C. viscidiflorus	< 0.1	5	18	2.3	10
Juniperus osteosperma	0.3	30	126	16.6	4
J. scopulorum	0.1	15	54	7.9	8
Opuntia polyacantha	< 0.1	10	72	6.2	9
Pinus edulis	0.6	45	269	28.9	3
Purshia tridentata	3.8	50	1,542	86.5	2
Symphoricarpos oreophilus	0.1	15	179	9.9	6
Totals	9.4		6,169		

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[1] Values based on 20 6 x 50 foot belt transects

[2] Importance value = relative cover + relative frequency + relative density

Table B-3-10 STRUCTURAL AND COMPOSITIONAL SUMMARY[1] FOR THE SHRUB LAYER IN A CHAINED RANGELAND COMMUNITY - STAND 7

Species	Cover (percent)	Frequency (percent)	No./ Hectare	Importance Value[2]	Rank
Amelanchier spp.	1.4	20	377	18.5	4
Artemisia tridentata	4.6	80	2,528	78.5	2
Cercocarpus montanus	0.1	35	430	13.9	6
Chrysothamnus nauseosus	0.2	15	72	5.9	11
C. viscidiflorus	0.1	25	126	7.5	9
Juniperus osteosperma	0.9	55	341	23.3	3
Opuntia polyacantha	0.2	45	466	17.5	5
Pinus edulis	0.2	35	251	12.6	7
Purshia tridentata	0.6	20	179	11.0	8
Quercus gambelii	0.4	5	287	7.1	10
Symphoricarpos oreophilus	6.1	75	4,035	104.2	1
Totals	14.8		9,092		

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[1] Values based on observations in 20 6 x 50 foot belt transects

[2] Importance value = relative cover + relative frequency + relative density

Table B-3-11 STRUCTURAL AND COMPOSITIONAL SUMMARY[1] FOR THE SHRUB LAYER IN AN UPLAND SAGEBRUSH COMMUNITY - STAND 8

Species	Cover (percent)	Frequency (percent)	No./ Hectare	Importance Value[2]	Rank
Artemisia tridentata	17.7	100	13,736	247.3	1
Chrysothamnus nauseosus	0.2	10	144	7.5	5
C. viscidiflorus	<0.1	10	72	5.9	6
Juniperus osteosperma	0.4	15	108	10.9	3
Opuntia polyacantha	<0.1	35	144	19.8	2
Pinus edulis	<0.1	15	72	8.6	4
Totals	18.6		14,276		

Table B-3-12 STRUCTURAL AND COMPOSITIONAL SUMMARY[3] FOR THE SHRUB LAYER IN A CHAINED RANGELAND COMMUNITY - STAND 14

Species	Cover (percent)	Frequency (percent)	No./ Hectare	Importance Value[2]	Rank
Amelanchier spp.	1.1	45	860	31.3	4
Artemisia tridentata	<0.1	10	54	3.2	9
Cercocarpus montanus	3.2	55	808	49.1	2
Chrysothamnus nauseosus	<0.1	5	27	1.6	10
Chrysothamnus viscidiflorus	0.3	50	618	22.9	6
Juniperus osteosperma	1.0	55	566	29.2	5
Opuntia polyacantha	<0.1	5	27	1.6	11
Pinus edulis	1.2	75	753	38.3	3
Purshia tridentata	1.2	20	296	17.9	7
Symphoricarpos oreophilus	5.2	80	2,905	100.9	1
Tetradymia canescens	<0.1	10	109	4.0	8
Totals	13.6		7,023		

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[1] Values based on observations in 20 6 x 50 foot belt transects

[2] Importance value = relative cover + relative frequency + relative density

[3] Values based on observations in 20 4 x 50 foot belt transects

Table B-3-13 STRUCTURAL AND COMPOSITIONAL SUMMARY[1] FOR THE SHRUB LAYER IN AN UPLAND SAGEBRUSH COMMUNITY - STAND 11

Species	Cover (percent)	Frequency (percent)	No./ Hectare	Importance Value[2]	Rank
Amelanchier spp.	<0.1	5	72	2.6	6
Artemisia tridentata	17.4	100	13,539	235.9	1
Juniperus osteosperma	0.1	15	54	7.1	4
J. scopulorum	<0.1	15	72	6.9	5
Opuntia polyacantha	0.2	50	359	24.9	2
Pinus edulis	0.2	45	179	21.5	3
Symphoricarpos oreophilus	<0.1	5	18	2.2	7
Totals	18.2		14,293		

Table B-3-14 STRUCTURAL AND COMPOSITIONAL SUMMARY[1] FOR THE SHRUB LAYER IN AN UPLAND SAGEBRUSH COMMUNITY - STAND 15

Species	Cover (percent)	Frequency (percent)	No./ Hectare	Importance Value[2]	Rank
Amelanchier spp.	3.9	100	2,823	49.2	3
Artemisia tridentata	18.1	100	9,710	133.8	1
Chrysothamnus viscidiflorus	1.2	95	8,151	58.8	2
Opuntia polyacantha	<0.1	10	81	2.6	7
Pinus edulis	<0.1	30	242	7.7	5
Purshia tridentata	<0.1	5	27	1.2	8
Symphoricarpos oreophilus	1.9	85	3,767	41.6	4
Tetradymia canescens	<0.1	20	133	5.0	6
Totals	25.5		24,934		

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[1] Values based on 20 6 x 50 foot belt transects

[2] Importance value = relative cover + relative frequency + relative density

Table B-3-15 STRUCTURAL AND COMPOSITIONAL SUMMARY[1] FOR THE SHRUB LAYER IN A BOTTOMLAND SAGEBRUSH COMMUNITY - STAND 16

Species	Cover (percent)	Frequency (percent)	No./ Hectare	Importance Value[2]	Rank
Artemisia tridentata	40.8	100	15,278	225.6	1
Chrysothamnus nauseosus	4.4	55	2,242	49.8	2
Opuntia polyacantha	0.1	30	215	16.4	3
Symphoricarpos oreophilus	0.1	15	108	8.2	4
Totals	45.4		17,843		

Table B-3-16 STRUCTURAL AND COMPOSITIONAL SUMMARY[1] FOR THE SHRUB LAYER IN A BOTTOMLAND SAGEBRUSH COMMUNITY - STAND 19

Species	Cover (percent)	Frequency (percent)	No./ Hectare	Importance Value[2]	Rank
Artemisia tridentata	38.9	100	17,502	261.8	1
Chrysothamnus nauseosus	2.5	30	502	30	2
Opuntia polyacantha	.1	10	72	7	3
Totals	41.5		18,076		

[1] Values are based on 20 6x50 foot belt transects

[2] Importance value = relative cover + relative frequency + relative density

Table B-3-17 STRUCTURAL AND COMPOSITIONAL SUMMARY[1] FOR THE SHRUB LAYER IN A DOUGLAS-FIR FOREST - STAND 21

Species	Cover (percent)	Frequency (percent)	No./ Hectare	Importance Value[2]	Rank
Cercocarpus montanus	0.3	10	109	7.4	6
Juniperus scopulorum	0.5	20	430	16.0	4
Pinus edulis	<0.1	20	215	11.8	5
Quercus gambelii	10.3	50	8176	134.7	1
Ribes cereum	1.8	20	538	24.0	3
Symphoricarpos oreophilus	4.3	70	7531	106.1	2
Totals	17.3		16999		

[1] Values based on 10 5 x 20 foot belt transects

[2] Importance values = relative cover + relative frequency + relative density

Table B-3-18 PERCENT FREQUENCY OF HERBACEOUS PLANTS IN SAMPLED STANDS 21-29 (VALUES BASED ON 10 1.0 m^2 QUADRATS)

Species	Stand Number 21	22	23	24	25	26	27	28	29
Agropyron dasystachyum	30								
Agropyron smithii		90	10	30	10	30	100		95
Amaranthus albidus		100	90				20		
Amaranthus graecizans								10	
Anaphallis margaritacea									20
Androsace septentrionalis	60								60
Antennaria rosea	50								65
Arabis holboellii	50								25
Artemisia dracunculus							10		
Artemisia ludoviciana									5
Astragalus diversifolius									5
Astragalus purshii					20				
Bromus anomalus	10								
Bromus japonicus						70	30	40	
Bromus marginatus									10
Bromus tectorum		100	100	80	100	100	60	80	5
Carex pensylvanica	40			10					20
Chaenactis douglasii					10	10			
Chamaesyce glyptosperma		10							
Chenopodium album	20	70			60		40	20	
Chenopodium sp.				50					
Cirsium arvense				10					
Collinsia parviflora	20								5
Commandra umbellata						10			
Crepis acuminatus									50
Cryptantha sp.							10	10	

Table B-3-18 (Continued)

Species	21	22	23	24	25	26	27	28	29
					Stand Number				
Descurainia pinnata		10		10	10				
Erigeron nematophyllus	50			20					85
Erigeron speciosus									5
Eriogonum umbellatum									35
Erysimum asperum	10								15
Festuca brachyphylla (?)	60								20
Gayophytum ramocissimum				10		10			
Haplopappus nuttallii									10
Heuchera parvifolia	20								55
Ipomopsis aggregata									20
Koeleria gracilis	30								50
Lactuca serriola						10			
Lappula redowskii		10			10	10			
Lepidium densiflorum						20			
Lepidium montanum		60					20		
Lithospermum ruderale									10
Lolium perenne					10	20		10	
Lupinus argenteus									10
Melilotus officinalis							50		
Mentzelia dispersa					40	20			
Oryzopsis hymenoides		30		40	80	80	30	10	40
Oryzopsis micrantha	30								5
Penstemon fremontii									10
Penstemon watsoni									30
Phlox hoodii									15
Phlox longifolia									55
Poa fendleriana	10					10			

Table B-3-18 (Continued)

Species	Stand Number								
	21	22	23	24	25	26	27	28	29
Poa pratensis			10						
Poa sp.									40
Polemoniaceae (Unknown)	60								
Polygonum rurivagum					50				
Polygonum sawatchense									5
Pulsatilla patens									40
Salsola kali		100	40	50	10	20	80	30	
Senecio multilobatus									30
Senecio sp.	40								
Sisymbrium altissimum		80	90	90		20		10	
Sitanion longifolium	30			10					
Sphaeralcea coccinea									10
Stipa comata									65
Taraxacum officinale	20			10			10		
Tragopogon dubius						10			
Unknown Mustard		10							
Non-herbaceous species <25m tall									
Amelanchier spp.									25
Artemisia tridentata									20
Ceratoides lanata							20		
Chrysothamnus nauseosus		10							
Chrysothamnus viscidiflorus									40
Opuntia polyacantha									5
Pachystima myrsinites									15
Pinus edulis	20								5
Pseudotsuga menziesii	10								
Symphoricarpos oreophilus	80								70

Table B-3-19 SUMMARY OF HERB AND WOODY COVER[1] (<25cm) IN THE HERB LAYER AND GROUND LAYER SUMMARY FOR STANDS 21-29

	Stand Number								
	21	22	23	24	25	26	27	28	29
Mean Herb Cover	13	46	82	38	30	50	34	4	18
Mean Woody Cover	1	2							2
Mean Moss Cover	10								7
Mean Cover-Crustose Lichen	1								<1
Mean Cover-Foliose-Fruticose Lichen	4								2
Mean Litter Cover	43	38	62	36	8	20	38	2	88
Mean Cover-Bare Soil	3	26	14	38	70	36	56	94	11
Mean Cover-Rock	5			4		4	6	6	1

[1] Values for stands 21-28 based on 10 0.1 m^2 quadrats
Values for stand 29 based on 20 1.0 m^2 quadrats

Table B-3-20 SHRUB LAYER STRUCTURAL AND COMPOSITIONAL SUMMARY[1] FOR MIXED MOUNTAIN SHRUBLANDS, STAND 29

Species	Mean Cover (percent)	Frequency (percent)	Density (No. per Hectare)	Importance Value[2]	Rank
Amelanchier spp.	11.80	100	16408	70.29	2
Artemisia tridentata	5.75	100	6266	40.01	3
Cercocarpus montanus	1.45	35	726	10.46	6
Chrysothamnus viscidiflorus	2.05	100	8741	33.46	4
Juniperus osteosperma	<0.01	5	27	0.83	13
Juniperus scopulorum	0.95	25	161	6.75	7
Opuntia polyacantha	<0.01	20	109	3.32	10
Pachystima myrsinites	<0.01	25	269	4.34	9
Pinus edulis	0.80	80	1077	16.34	5
Purshia tridentata	0.20	25	403	5.07	8
Ribes Cereum	<0.01	5	215	1.09	12
Symphoricarpos oreophilus	14.15	100	37262	105.41	1
Tetradymia canescens	<0.01	10	753	2.63	11
Total	37.15		72417	300.00	

[1] Based on 20 4 x 50 foot belt transects

[2] Importance value = relative cover + relative frequency + relative density

Table B-3-21 STRUCTURAL AND COMPOSITIONAL SUMMARY[1] FOR THE SHRUB LAYER IN A BUNCHGRASS COMMUNITY - STAND 20

Species	Cover (percent)	Frequency (percent)	No./ Hectare	Importance Value[2]	Rank
Artemisia tridentata	0.4	35	179	31.7	3
Atriplex confertifolia	4.9	85	1,686	193.4	1
Atriplex canescens	0.4	20	448	33.8	2
Ceratoides lanata	0.2	10	72	10.7	5
Chrysothamnus nauseosus	0.0	5	18	3.4	7
C. viscidiflorus	0.1	20	161	18.6	4
Opuntia polyacantha	0.0	5	54	4.7	6
Sarcobatus vermiculatus	0.0	5	18	3.4	8
Totals	6.0		2,636		

[1] Values based on observations in 20 6 x 50 foot belt transects

[2] Importance value = relative cover + relative frequency + relative density

Table B-3-22 STRUCTURAL AND COMPOSITIONAL SUMMARY[1] FOR THE SHRUB LAYER IN A RABBITBRUSH COMMUNITY - STAND 17

Species	Cover (percent)	Frequency (percent)	No./ Hectare	Importance Value[2]	Rank
Artemisia tridentata	0.3	31.58	452	28.6	2
Chrysothamnus nauseosus	43.2	100.00	10910	271.4	1
Totals	43.5		11362		

Table B-3-23 STRUCTURAL AND COMPOSITIONAL SUMMARY[1] FOR THE SHRUB LAYER IN A GREASEWOOD COMMUNITY - STAND 18

Species	Cover (percent)	Frequency (percent)	No./ Hectare	Importance Value[2]	Rank
Artemisia tridentata	.1	10	356	7.2	3
Atriplex canescens	0.3	5	18	4.5	4
Chrysothamnus nauseosus	3.2	40	699	46.9	2
Sarcobatus vermiculatus	27.1	100	5918	242.7	1
Totals	30.7		6671		

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[1] Values based on observations in 20 6x50 foot belt transects

[2] Importance value = relative cover + relative frequency + relative density

Table B-3-24 SUMMARY OF 1975 HERB LAYER SPECIES FREQUENCY AT EACH OF THE INTENSIVE STUDY PLOTS (VALUES ARE BASED ON 25 1.0 m^2 QUADRATS)

Species	1-0	1-F	2-0	2-F	3-0	3-F	4-0	4-F	5-0	5-F	6-0	6-F
HERBACEOUS SPECIES												
Agoseris glauca	8	8		8	100	88				4	4	
Agropyron desertorum	44	36	36	36					12	24		
Agropyron smithii	24	16	20	32		100	56	44		16	76	72
Agropyron spicatum		4		4					8	4		
Agropyron trachycaulum	4						4					
Androsace septentrionalis									4			
Antennaria parvifolia		8			20	28						8
Antennaria rosea	20	12	4	12		4					48	40
Arabis holboellii	16	8	32	12	84	80			12	28	24	36
Artemisia frigida								4				
Artemisia ludoviciana	12	8										4
Aster fendleri	4	16										
Aster sp.				12						4		
Astragalus ceramicus	8	28	8	4						4	28	36
Astragalus diversifolius						20					4	4
Astragalus purshii					32	16					4	
Astragalus scopulorum						12						
Astragalus spatulatus					24	12						
Bouteloua gracilis	4		12	12			12					4
Bromus tectorum	92	76	100	96		4	100	100	24	36	16	
Calochortus nuttallii	8				100	100					8	16
Castilleja chromosa					12							
Castilleja linariaefolia					24	64						

Table B-3-24 (Continued)

Species	1-0	1-F	2-0	2-F	3-0	3-F	4-0	4-F	5-0	5-F	6-0	6-F
HERBACEOUS SPECIES (Cont.)												
Carex pensylvanica	16	32	4		96	80			32	28	12	56
Carex sp.	16							4				
Chaenactis douglasii	12	8								4		
Chenopodium album	28	20	64	24			68	40	24	32	24	20
Cirsium sp.									4			
Cirsium undulatum								4				
Collinsia parviflora		12		8					40	60	12	8
Comandra umbellata											12	60
Crepis acuminatus					100						36	48
Cryptantha sp.	8	24							20	8		
Cryptantha sp. (slender)									4	8		
Cymopterus sp. (?)											28	12
Delphinium nelsoni			4			4						
Descurainia pinnata	40	24	24	16			40	28	44	32	4	12
Draba reptans				4					8	4		
Erigeron nematophyllus		20	20	16	76	96			4		40	56
Eriogonum alatum						16						
Erodium cicutarium		4										
Erysimum asperum									12	12	4	
Festuca brachyphylla (?)	4	12		4	64	84			4	4	32	48
Gayophytum ramocissimum	12	12	44	36		24						4
Haplopappus nuttallii		16									8	
Hedysarum boreale					16	16						
Heterotheca villosa			12	8								

Table B-3-24 (Continued)

Species	1-0	1-F	2-0	2-F	3-0	3-F	4-0	4-F	5-0	5-F	6-0	6-F
HERBACEOUS SPECIES (Cont.)												
Ipomopsis aggregata	4											
Koeleria gracilis	4	32	8	12	100	100					24	64
Lappula redowskii	8	12	36	24			52	16			8	8
Lepidium densiflorum		8						48				
Lepidium montanum							28					
Lomatium foeniculaceum				4								
Lomatium orientale	12				72	80					4	12
Lupinus argenteus	4					12						
Mentzelia dispersa	8	8		8								
Microsteris micrantha		8	8	4	100	100						
Navarettia sp. (?)										4		
Oryzopsis hymenoides	48	64	12	16			20		68	48	4	12
Oryzopsis micrantha							20	32	24	32		
Penstemon caespitosus												
Penstemon fremontii					52	52				4		
Phlox hoodii		32			100	88			4		40	64
Phlox longifolia	8		4	12	96	100			4	4	64	68
Physaria floribunda		8					8	12	4			
Poa fendleriana		36			64	92			20		20	40
Poa pratensis		4	8	4								
Poa sp.				24			16	4			4	20
Polygonum sawatchense	12	4	4	4		24					4	8
Senecio multilobatus		12						4		4	12	
Sitanion longifolium	20	44	36	36					72	72	8	4

Table B-3-24 (Continued)

Species	1-0	1-F	2-0	2-F	3-0	3-F	4-0	4-F	5-0	5-F	6-0	6-F
HERBACEOUS SPECIES (Cont.)												
Sphaeralcea coccinea			8	4	68	36					20	20
Stephanomeria tenuifolia											8	20
Stipa comata	20	16		4	8	36	8	8		4	40	28
Streptanthus cordatus										8		
Taraxacum officinale	4	8	16	8		4		4		4		
Townsendia sericea	4				8							
Tragopogon dubius	4											
Trifolium gymnocarpon					96	88						
Unknown Basal			4									
Unknown Mustard			4	8			24	4				
Viola nuttallii							4					
Zygadenus venenosus		4				16						8
NON-HERBACEOUS SPECIES												
Amelanchier spp.		4	4								4	
Artemisia tridentata	4	12	4	8	44	88	44	64			8	
Ceratoides lanata							8	16				
Chrysothamnus nauseosus		4	16	8							4	
Chrysothamnus viscidiflorus			4									
Gutierrezia sarothrae	12	24			12	24						
Juniperus osteosperma										4		
Pinus edulis	4			4					8	4	12	
Purshia tridentata	12			4					4			
Symphoricarpos oreophilus	8			4			4					
Unknown Composite												64

Table B-3-25 SUMMARY OF 1976 HERB LAYER SPECIES FREQUENCY AT EACH OF THE INTENSIVE STUDY PLOTS (VALUES BASED ON 25 1.0 m^2 QUADRATS)

Species	1-0	1-F	2-0	2-F	3-0	3-F	4-0	4-F	5-0	5-F	6-0	6-F
HERBACEOUS SPECIES												
Agoseris glauca	12	12	4	8		4						
Agropyron dasystachum		4										
Agropyron desertorum	44	36	36	40					20	24		
Agropyron smithii	36	12	20	28	100	100	76	44	16	24	84	92
Androsace septentrionalis									4			
Antennaria parvifolia			4		16	28			4		24	44
Antennaria rosea	24	32	4	8							24	24
Arabis holboellii	20	8	16	8	80	80			12	36	24	24
Artemisia frigida								4				
Artemisia ludoviciana	12	8										4
Aster fendleri	8	32	60	36								
Aster glaucodes			4									
Astragalus ceramicus	4	32	8	4						4	8	28
Astragalus diversifolius				4	4	28					4	4
Astragalus purshii					32	24					12	
Astragalus scopulorum					8	12					4	
Astragalus spatulatus					12	12						
Bouteloua gracilis	4		16	16			12					4
Bromus tectorum	100	84	100	88		4	100	100	28	40	8	
Calochortus nuttallii						20						
Carex pensylvanica		32	4		92	80			28	32	32	72
Carex sp.	40							4				
Castilleja linariaefolia					56	80						

Table B-3-25 (Continued)

Species	1-0	1-F	2-0	2-F	3-0	3-F	4-0	4-F	5-0	5-F	6-0	6-F
HERBACEOUS SPECIES (Cont.)												
Chaenactis douglasii	24	8								4	4	
Chenopodium album	12	8	68	28			44	20	12	4		4
Collinsia parviflora		8		12	60	92			8	32	4	
Comandra umbellata											12	64
Crepis acuminata	4	4	4		100	88					40	68
Cryptantha sp.	4	20							20	8		
Descurainia pinnata	12	4	4	4			24	12	4	8		
Erigeron nematophyllus		4		4	88	96		4	4		36	64
Eriogonum alatum						4						
Erodium cicutarium		4										
Erysimum asperum									8	12		
Euphorbia robusta	8											
Festuca brachyphylla (?)	8	44	24	24	96	100			16	12	56	96
Gayophytum ramocissimum	16		40	44		16						
Haplopappus nuttallii		12									12	
Hedysarum boreale					8	16						
Heterotheca villosa			4	4								
Ipomopsis aggregata	4	8										
Koeleria gracilis		20	4		100	100		4	4		28	76
Lappula redowskii	4	12	40	24		4	24				4	
Lepidium densiflorum		4										
Lepidium montanum							20	28				
Lomatium foeniculaceum				4								

Table B-3-25 (Continued)

Species	1-0	1-F	2-0	2-F	3-0	3-F	4-0	4-F	5-0	5-F	6-0	6-F
HERBACEOUS SPECIES (Cont.)												
Lomatium orientale	4				28	16					4	
Lupinus argenteus	4				4	24						
Mentzelia dispersa		4		4								
Microsteris micrantha			20	12	68	56						
Navarretia sp. (?)									8			
Oryzopsis micrantha							20		20	36		
Oryzopsis hymenoides	60	88	8	20			32	40	76	52		4
Penstemon caespitosus						4						
Penstemon fremontii					48	44				4		
Phlox hoodii		36			100	92			4		48	68
Phlox longifolia	8		4	8	96	100				4	68	72
Physaria floribunda		8						4	4			
Poa fendleriana						20						4
Poa pratensis			4									
Poa sp.			28				4		8		16	4
Polygonum douglasii		12										
Polygonum sawatchense			24	32		44					8	
Senecio multilobatus	24	12						4	4		12	
Sisymbrium altissimum		4	12									
Sisymbrium officinale			16									
Sitanion longifolium	24	40	44	40			8	4	44	76	12	
Sphaeralcea coccinea			8	12	68	36					20	16
Stephanomeria tenuifolia											12	12

Table B-3-25 (Continued)

Species	1-0	1-F	2-0	2-F	3-0	3-F	4-0	4-F	5-0	5-F	6-0	6-F
HERBACEOUS SPECIES (Cont.)												
Stipa comata	24	4		4	4		24	8		8	52	12
Streptanthus cordatus									4	8		
Taraxacum officinale	4		8	8								
Townsendia sericea	4				4							
Tragopogon dubius									4	4		
Trifolium gymnocarpon					96	84						
Unknown Grass	4											
Unknown Mustard			4				24	4				
Unknown Seedling				8								
Viola nuttallii							4	4				
NON-HERBACEOUS SPECIES												
Amelanchier spp.	4	4									4	
Artemisia tridentata	16	24	36	28	68	96	64	84		4	4	4
Ceratoides lanata								20				
Cercocarpus montanus		4										
Chrysothamnus nauseosus		12	44	24			4				8	
Gutierrezia sarothrae	24	28	8		28	20						
Juniperus osteosperma				4						4		
Opuntia polyacantha			4			8	4					8
Pinus edulis	8			4							4	
Purshia tridentata	16	4		4								
Symphoricarpos oreophilus	8						4	4				
Unknown composite												68

Table B-3-26 SUMMARY[1] OF HERB AND WOODY COVER (<25cm) IN THE HERB LAYER, GROUND LAYER SUMMARY, AND SPECIES DENSITY AT EACH OF THE INTENSIVE STUDY PLOTS FOR 1975

	1-0	1-F	2-0	2-F	3-0	3-F	4-0	4-F	5-0	5-F	6-0	6-F
Mean Herb Cover	15.0	23.0	21.0	23.0	30.4	44.2	17.3	13.7	6.6	8.6	10.7	21.9
Mean Woody Cover	0.7	0.4	0.4	0.2	0.4	1.0	1.5	2.4	0.2	<0.1	0.2	--
Mean Moss Cover	0.7	0.1	0.1	0.3	2.6	1.2	27.3	35.0	3.2	3.5	8.2	1.8
Mean Cover-Crustose Lichen	1.0	0.2	0.2	1.1	--	--	--	<0.1	2.0	0.4	0.1	<0.1
Mean Cover-Foliose/ Fruticose Lichen	--	--	--	--	0.7	0.3	--	--	--	--	0.4	<0.1
Mean Litter Cover	63.0	70.0	69.0	64.0	25.8	39.6	81.8	59.0	83.1	81.9	74.4	70.7
Mean Cover--Bare Soil	31.0	26.0	24.0	23.0	51.0	23.8	6.8	16.9	14.8	14.4	22.6	28.9
Mean Cover--Rock	3.0	2.0	2.0	3.0	--	--	--	--	1.6	1.9	--	--
Mean No. of Herb Species/ Quadrat	5.40	7.04	5.56	5.16	15.12	16.64	4.60	3.52	4.56	4.96	6.84	9.00
Mean Total No. Species/ Quadrat	5.80	7.48	5.84	5.44	15.68	17.76	5.16	4.32	4.68	5.04	7.12	9.64

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[1] Based on observations at 25 1.0 m^2 quadrats

Table B-3-27 SUMMARY[1] OF HERB AND WOODY COVER IN THE HERB LAYER, GROUND LAYER SUMMARY, AND SPECIES DENSITY AT EACH OF THE INTENSIVE STUDY PLOTS FOR 1976

	1-0	1-F	2-0	2-F	3-0	3-F	4-0	4-F	5-0	5-F	6-0	6-F
Mean Herb Cover	17.5	27.0	22.5	26.6	27.8	45.8	7.3	9.3	6.2	7.8	11.4	21.9
Mean Woody Cover	1.1	1.2	0.4	0.2	0.8	1.0	2.0	5.0	-	0.1	0.1	2.9
Mean Moss Cover	1.5	0.1	-	0.2	3.2	0.9	31.2	36.6	3.2	2.7	2.1	0.5
Mean Cover-Crustose Lichen	2.0	0.2	0.3	1.2	-	-	-	0.1	1.2	0.5	0.1	0.1
Mean Cover-Foliose/ Fruticose Lichen	-	-	-	-	1.8	0.2	-	-	-	-	0.1	0.1
Mean Litter Cover	62.7	76.0	81.2	78.8	47.6	65.9	87.3	74.2	84.5	77.6	80.4	77.4
Mean Cover-Bare Soil	34.3	23.0	17.6	19.4	52.4	32.1	9.5	14.8	12.9	20.9	19.6	22.6
Mean Cover-Rock	3.2	1.4	1.6	1.8	-	-	-	0.1	1.9	1.5	-	-
Mean No. of Herb Species per Quadrat	5.60	6.60	6.16	5.36	13.68	15.04	4.24	2.88	3.64	4.28	6.72	8.60
Mean Total No. of Species per Quadrat	6.35	7.36	7.08	6.00	14.64	16.28	5.00	3.96	3.64	4.36	6.92	9.40

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[1] Based on observations at 25 1.0 m^2 quadrats

Table B-3-28 FREQUENCY VALUES[1] FOR SHRUBS AT EACH OF THE INTENSIVE STUDY PLOTS FOR 1974

Species	1-0	1-F	2-0	2-F	3-0	3-F	4-0	4-F	5-0	5-F	6-0	6-F
Amelanchier spp.	40		20	30		40			50	20	40	15
Artemisia tridentata	100	80	50	35	100	100	100	100	25	25	70	80
Ceratoides lanata							15	70				
Cercocarpus montanus	65	50	25	10					5	30		
Chrysothamnus nauseosus	30	50	85	50		10	15	10		5	15	
Chrysothamnus viscidiflorus	5	5	5	5		5						5
Gutierrezia sarothrae	5	15	5		15	40						
Juniperus osteosperma	40	25	50	70	5				25	5	10	40
Juniperus scopulorum	5	5							10			
Opuntia polyacantha	20	10	35	10	55	35	35	5			45	45
Pinus edulis	55	25	65	65	15	35			50	35	20	45
Purshia tridentata	65	50	20	35				5	5	20		5
Symphoricarpos oreophilus	30	20	10								5	

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[1] Values based on 20 10 x 4 meter belt transects

Table B-3-29 FREQUENCY VALUES[1] FOR SHRUBS AT EACH OF THE INTENSIVE STUDY PLOTS FOR 1976

Species	1-0	1-F	2-0	2-F	3-0	3-F	4-0	4-F	5-0	5-F	6-0	6-F
Amelanchier spp.	30	10	10	10		35			20		25	10
Artemisia tridentata	100	80	50	65	100	100	100	100	45	25	65	85
Artemisia sp.				5								
Ceratoides lanata			5	10			15	70				
Cercocarpus montanus	65	55	25	25					25	30		
Chrysothamnus nauseosus	45	50	90	70		15	20	5		10	10	
Chrysothamnus viscidiflorus	15	5	10	10								
Gutierrezia sarothrae	15	15										
Juniperus osteosperma	35	20	60	80	15	5			20	5	15	25
Juniperus scopulorum	15							5	10			
Opuntia polyacantha	10				20	30	30	15		10	20	20
Pinus edulis	70	25	60	65	20	35			55	30	10	30
Purshia tridentata	80	65	25	55					5	15		5
Symphoricarpos oreophilus	30	20	20	30			10		35	10	15	5

[1] Values based on 20 10 x 4 meter belt transects

Table B-3-30 PERCENT COVER VALUES[1] FOR SHRUB SPECIES AT EACH OF THE INTENSIVE STUDY PLOTS, 1974

Species	1-0	1-F	2-0	2-F	3-0	3-F	4-0	4-F	5-0	5-F	6-0	6-F
Amelanchier spp.	0.3	0.6	0.2						0.6	0.2	0.4	
Artemisia tridentata	9.6	5.3	0.3	1.1	5.2	10.0	36.8	29.6	0.6	0.8	1.6	1.6
Ceratoides lanata							0.1	1.8				
Cercocarpus montanus	0.4	0.1	0.3	0.4						0.4		
Chrysothemnus nauseosus	0.4	1.4	2.6	0.6		0.1					0.2	
Gutierrezia sarothrae		0.5				0.1						
Juniperus osteosperma	0.6	0.2	1.3	2.8							0.1	0.1
Juniperus scopulorum	1.0											
Opuntia polyacantha						0.1	0.2				0.1	0.1
Pinus edulis	0.8	0.2	0.8	1.2	0.2	0.6			1.2	0.2	0.3	
Purshia tridentata	1.2	0.6		3.2					0.2			
Symphoricarpos oreophilus	0.2	0.1										
Total	14.5	9.0	5.5	9.3	5.4	10.9	37.1	31.4	2.6	1.6	2.7	1.8

[1] Values based on 20 10 meter line transects

Table B-3-31 PERCENT COVER VALUES[1] FOR SHRUB SPECIES AT EACH OF THE INTENSIVE STUDY PLOTS FOR 1976

Species	1-0	1-F	2-0	2-F	3-0	3-F	4-0	4-F	5-0	5-F	6-0	6-F
Amelanchier spp.	0.34	0.79	0.58							0.06	0.98	
Artemisia tridentata	10.33	7.38	0.94	1.65	5.52	12.34	29.50	39.47	0.46	1.37	1.28	0.98
Ceratoides lanata	0.30		0.52	0.21								
Cercocarpus montanus	0.34	0.09	0.15	0.52					0.27	0.82		
Chrysothamnus nauseosus	0.21	1.52	3.35	1.80		0.37					0.21	
Gutierrezia sarothrae	0.55	0.61				0.12						
Juniperus osteosperma	0.40	0.21	1.22	4.02							0.06	0.03
Juniperus scopulorum	1.40	0.12										
Opuntia polyacantha							0.09	0.76			0.03	
Pinus edulis	1.62	0.24	0.46	1.89	0.30	0.52			0.67		1.46	
Purshia tridentata	1.92	1.58	0.55	3.78					0.18			
Symphoricarpos oreophilus	0.15		0.06						0.49	0.03		
Total	17.56	12.54	7.83	13.87	5.82	13.35	29.59	40.23	2.07	2.28	4.02	1.01

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[1] Values based on 20 10-meter line transects

Table B-3-32 PERCENT COMPOSITION[1] (RELATIVE COVER) FOR SHRUB SPECIES AT EACH OF THE INTENSIVE STUDY PLOTS, 1974

Species	1-0	1-F	2-0	2-F	3-0	3-F	4-0	4-F	5-0	5-F	6-0	6-F
Amelanchier spp.	2.1	6.6	3.7	0.5					23.5	13.3	13.2	
Artemisia tridentata	66.8	58.6	5.5	11.7	96.3	92.6	99.2	94.1	25.5	53.4	60.4	91.4
Ceratoides lanata							0.3	5.9				
Cercocarpus montanus	3.1	1.1	5.5	4.3						23.3		
Chrysothamnus nauseosus	2.8	15.5	46.7	6.9		0.9					9.4	
Gutierrezia sarothrae		5.5				0.5						
Juniperus osteosperma	3.8	2.2	23.9	30.3							1.9	2.9
Juniperus scopulorum	6.6											
Opuntia polyacantha						0.5	0.5				3.8	5.7
Pinus edulis	5.5	2.8	13.8	12.2	3.7	5.5			45.1	10.0	11.3	
Purshia tridentata	8.3	6.6		34.1					5.9			
Symphoricarpos oreophilus	1.0	1.1	0.9									

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[1] Values based on 20 10-meter line transects in each plot

Table B-3-33 PERCENT COMPOSITION[1] (RELATIVE COVER) FOR SHRUB SPECIES AT EACH OF THE INTENSIVE STUDY PLOTS FOR 1976

Species	1-0	1-F	2-0	2-F	3-0	3-F	4-0	4-F	5-0	5-F	6-0	6-F
Amelanchier spp.	1.9	6.3	7.4							2.6	24.4	
Artemisia tridentata	58.5	58.6	12.0	11.9	95.3	92.4	99.7	98.1	22.2	59.8	31.8	97.0
Ceratoides lanata	1.7		6.6	1.5								
Cercocarpus montanus	1.9	0.7	1.9	3.7					13.0	35.8		
Chrysothamnus nauseosus	1.2	12.1	42.8	12.9		2.8					5.2	
Gutierrezia sarothrae	3.1	4.8				0.9						
Juniperus osteosperma	2.3	1.7	15.6	28.9							1.5	3.0
Juniperus scopulorum	7.9	1.0										
Opuntia polyacantha							0.3	1.9			0.7	
Pinus edulis	9.2	1.9	5.9	13.6	5.2	3.9			32.4		36.3	
Purshia tridentata	10.9	12.5	7.0	27.2					8.7			
Symphoricarpos oreophilus	0.8		0.8						23.7	1.3		

[1] Values based on 20 10-meter line transects in each plot

Table B-3-34 DENSITY VALUES[1] (NO. PER HECTARE) FOR SHRUB SPECIES AT EACH OF THE INTENSIVE STUDY PLOTS FOR 1974

Species	Height Class[2]	1-0	1-F	2-0	2-F	3-0	3-F	4-0	4-F	5-0	5-F	6-0	6-F
Amelanchier spp.	1	162	25	62	75		150			225	88	188	62
	2	25	12	12	25							12	
	Total	187	37	74	100		150			225	88	200	62
Artemisia tridenta	1	2162	988	138	212	7050	8500	17388	11625	238	75	1275	1475
	2	712	600	62	50		25	4362	4912	38	25	100	
	3	12	12					1700	1562				
	4							12					
	Total	2886	1600	200	262	7050	8525	23462	18099	276	100	1375	1475
Ceratoides lanata	1							212	2588				
	Total							212	2588				
Cercocarpus montanus	1	262	138	38	50					12	138		
	2	88	112	25							12		
	3			12	12								
	Total	350	250	75	62					12	150		
Chrysothamnus nauseosus	1	175	262	388	175		25	62	50		12	212	
	2	25	12	100	50								
	Total	200	274	488	225		25	62	50		12	212	
Chrysothamnus viscidiflorus	1	12	12	12	12		12						12
	Total	12	12	12	12		12						12

Table B-3-34 (Continued)

Species	Height Class^2	1-0	1-F	2-0	2-F	3-0	3-F	4-0	4-F	5-0	5-F	6-0	6-F
Gutierrezia sarothrae	1	12	75	12		62	100						
	Total	12	75	12		62	100						
Juniperus osteosperma	1	75	38	75	200	12				38	12	25	112
	2	62	50	162	225					12			38
	3			12	12					12			
	4				12								
	Total	137	88	249	449	12				62	12	25	150
Juniperus scopulorum	1	25	12							12			
	2	25											
	4									12			
	Total	50	12							24			
Opuntia polyacantha	1	100	125	200	100	288	100	125	88			325	550
	Total	100	125	200	100	288	100	125	88			325	550
Pinus edulis	1	138	125	212	162	25	100			150	112	25	175
	2	125	38	75	138	12	12			62		25	38
	3	38	12	25	38					62	12		
	4									25	25	25	12
	Total	301	175	312	550	37	112			299	149	75	225

Table B-3-34 (Continued)

Species	Height Class[2]	1-0	1-F	2-0	2-F	3-0	3-F	4-0	4-F	5-0	5-F	6-0	6-F
Purshia tridentata	1	588	225	88	225				12	12	150		12
	2	12	50	12	125								
	Total	600	275	100	350				12	12	150		12
Symphoricarpos oreophilus	1	150	112	112								12	
	Total	150	112	112								12	

[1] Values based on 20 10m x 4m belt transects.

[2] Height class 1 = 0.25m - 0.75m;
class 2 = 0.76m - 1.50m;
class 3 = 1.51m - 2.25m
class 4 = >2.25m.

Table B-3-35 DENSITY VALUES^{1} (NO. PER HECTARE) FOR SHRUB SPECIES AT EACH OF THE INTENSIVE STUDY PLOTS FOR 1976

Species	Height Class^{2}	1-0	1-F	2-0	2-F	3-0	3-F	4-0	4-F	5-0	5-F	6-0	6-F
Amelanchier spp.	1	99	25	49	25					37		99	49
	2	49	12		12					25		25	
	3			12									
	Total	148	37	61	37					62		124	49
Artemisia tridentata	1	2561	788	151	388	5409	6222	21504	20365	175	25	1025	1499
	2	1074	724	86	200		551	9571	6973	126		299	37
	3	25	49	12	49			2374	1475		37	25	
	4							49	49				
	Total	3661	1561	249	637	5409	6773	33498	28862	301	62	1349	1536
Artemisia sp.	1												
	2				12								
	Total				12								
Ceratoides lanata	1			74	200			126	3100				
	Total			74	200			126	3100				
Cercocarpus montanus	1	375	138	62	62					49	114		
	2	114	163	37	12					25	86		
	3		49	25	12								
	4			12	12					12			
	Total	489	363	124	99					86	200		
Chrysothamnus nauseosus	1	212	188	1037	262		49	99	12			138	
	2	12	62	225	114				12		25		
	3						12						
	Total	224	250	1262	376		61	99	24		25	138	

Table B-3-35 (Continued)

Species	Height Class^2	1-0	1-F	2-0	2-F	3-0	3-F	4-0	4-F	5-0	5-F	6-0	6-F
Chrysothamnus viscidiflorus	1	49	12	25	25								
	Total	49	12	25	25								
Gutierrezia sarothrae	1	49	62										
	Total	49	62										
Juniperus osteosperma	1	37	49	74	138	37	12			37	12	25	74
	2	62	12	175	225					12		12	62
	3			37	37								
	4				25								
	Total	99	61	286	425	37	12			49	12	37	136
Juniperus scopulorum	1	12							12	25			
	2	25											
	Total	37							12	25			
Opuntia polyacantha	1	25				49	126	163	126		25	188	225
	Total	25				49	126	163	126		25	188	225
Pinus edulis	1	188	114	114	212	49				188	126	12	111
	2	200	49	126	225					112		12	49
	3	49	25	49	86		99			49	25		
	4			12									
	Total	437	188	301	523	49	99			349	151	24	160
Purshia tridentata	1	874	299	74	175					62	151		
	2	1000	212	37	249								12
	3			12									
	Total	1874	511	123	424					62	151		12

Table B-3-35 (Continued)

Species	Height Class[2]	1-0	1-F	2-0	2-F	3-0	3-F	4-0	4-F	5-0	5-F	6-0	6-F
Symphoricarpos oreophilus	1	262	62	99	49			25		225	62	188	12
	2		25		37							12	
	Total	262	87	99	86			25		225	62	200	12

[1] Values based on 20 10m x 4m belt transects.
[2] Height class 1 = 0.25m - 0.75m;
class 2 = 0.76m - 1.50m;
class 3 = 1.51m - 2.25m;
class 4 = >2.26m.

Table B-3-36 MEAN DIAMETERS AT BREAST HEIGHT AND PRESENT CANOPY COVER FOR TREE SPECIES AT INTENSIVE STUDY PLOTS 5 AND 6

Species	No. of Trees	Mean Diameter Breast Height ±S.E. (cm.) 1974	Mean Diameter Breast Height ±S.E. (cm.) 1976	Mean Increase in Diameter ±S.E. (cm.)	% Canopy Cover 1975
PLOT 5-F					
Pinus edulis	31	26.4±1.8	26.3±1.8	-0.1±0.15	17.8
Juniperus osteosperma	31	27.7±2.7	28.4±2.7	0.7±0.30	9.6
Juniperus scopulorum	6	24.0±4.7	24.2±4.6	0.2±0.08	-
PLOT 5-0					
Pinus edulis	10	19.1±2.7	19.4±2.6	0.3±0.08	8.3
Juniperus osteosperma	44	25.6±2.1	25.8±2.1	0.2±0.10	20.3
Juniperus scopulorum	5	21.8±3.8	22.2±4.2	0.5±0.94	1.4
PLOT 6-F					
Pinus edulis	38	21.6±1.3	21.8±1.3	0.2±0.10	24.8
Juniperus osteosperma	7	21.2±3.4	21.2±3.4	0.1±0.35	7.5
PLOT 6-0					
Pinus edulis	59	24.6±1.4	24.8±1.4	0.1±0.15	32.4
Juniperus osteosperma	13	20.3±2.8	20.8±2.8	0.4±0.10	3.4
Juniperus scopulorum	1	4.2	4.4	0.2	0.9

Table B-3-37 SUMMARY OF HERB PHENOLOGICAL DATA[1] AT EACH OF THE INTENSIVE STUDY PLOTS--1976

	Mean No. of individuals per m^2 in each phenophase				Percent of Population			
	May 15 1976	June 22 1976	July 20 1976	August 17 1976	May	June	July	August
Oryzopsis hymenoides								
PLOT 1-0								
Phenophase 1	1.2	2.0	4.4	4.8	100	100	92	100
Phenophase 4			0.4				8	
Total	1.2	2.0	4.8	4.8				
PLOT 1-F								
Phenophase 1	8.0	7.3	8.4	8.0	100	86	91	91
Phenophase 2		0.8				9		
Phenophase 3		0.4				5		
Phenophase 5			0.4				4	
Phenophase 6				0.8				9
Phenophase 8			0.4				4	
Total	8.0	8.5	9.2	8.8				
Agropyron desertorum								
PLOT 1-0								
Phenophase 1	26.8	22.4	20.4	20.4	100	72	66	65
Phenophase 2		2.8				9		
Phenophase 3		4.4	0.4	2.0		14	1	6
Phenophase 4		1.2	0.8	1.2		4	3	4
Phenophase 5			2.4	0.8			8	2
Phenophase 6				1.2				4
Phenophase 7		0.4	6.8	1.2		1	22	4
Phenophase 8				4.8				15
Total	26.8	31.2	30.8	31.6				

Table B-3-37 (Continued)

	Mean No. of individuals per m^2 in each phenophase				Percent of Population			
					May	June	July	August
Agropyron desertorum	May 15 1976	June 22 1976	July 20 1976	August 17 1976				
PLOT 1-F								
Phenophase 1	18.8	21.2	20.0	21.2	100	88	74	76
Phenophase 2		1.2		0.4		5		1
Phenophase 3		1.2	0.8			5	3	
Phenophase 4		0.4	0.4			2	1	
Phenophase 5			2.0	0.4			7	1
Phenophase 6				2.0				7
Phenophase 7			2.8	2.4			10	9
Phenophase 8			1.2	1.6			4	6
Total	18.8	24.0	27.2	28.0				
Oryzopsis hymenoides	May 19 1976	June 17 1976	July 19 1976	August 19 1976				
PLOT 2-0								
Phenophase 1	1.2	0.8		0.4	100	67		33
Phenophase 5		0.4	0.4	0.4		33	67	33
Phenophase 6			0.8	0.4			33	33
Total	1.2	1.2	1.2	1.2				
PLOT 2-F								
Phenophase 1	1.2	1.2	0.4	0.4	100	100	33	100
Phenophase 8			0.8				67	
Total	1.2	1.2	1.2	0.4				

Table B-3-37 (Continued)

	Mean No. of individuals per m^2 in each phenophase				Percent of Population			
	May 19 1976	June 17 1976	July 19 1976	August 19 1976	May	June	July	August
Agropyron desertorum								
PLOT 2-0								
Phenophase 1	7.2	5.7	5.6	7.2	100	56	50	62
Phenophase 2			0.4				4	
Phenophase 3				1.2				10
Phenophase 4		2.8	2.0			28	18	
Phenophase 5		1.6	2.8	0.8		16	25	7
Phenophase 6				2.4				21
Phenophase 7			0.4				4	
Total	7.2	10.1	11.2	11.6				
PLOT 2-F								
Phenophase 1	8.8	11.6	13.2	12.0	100	81	79	70
Phenophase 2			0.4				2	
Phenophase 3			0.4				2	
Phenophase 4		1.6				11		
Phenophase 5		0.8				6		
Phenophase 6		0.4		3.2		3		19
Phenophase 7			2.8	1.6			17	9
Phenophase 8				0.4				2
Total	8.8	14.4	16.8	17.2				

Table B-3-37 (Continued)

	Mean No. of individuals per m^2 in each phenophase				Percent of Population			
					May	June	July	August
Sitanion longifolium	May 19 1976	June 19 1976	July 19 1976	August 19 1976				
PLOT 2-0								
Phenophase 1	2.8	6.4	6.0	5.2	100	84	75	65
Phenophase 2		0.4		1.2		5		15
Phenophase 5		0.8	0.8			11	10	
Phenophase 6			0.8	1.2			10	15
Phenophase 7			0.4				5	
Phenophase 8				0.4				5
Total	2.8	7.6	8.0	8.0				
PLOT 2-F								
Phenophase 1	4.8	0.4	2.4	2.4	100	9	50	46
Phenophase 2		2.0	0.8			45	17	
Phenophase 3		1.6				36		
Phenophase 4			0.4				8	
Phenophase 5		0.4	0.4			9	8	
Phenophase 6				1.2				23
Phenophase 7			0.8	1.6			17	31
Total	4.8	4.4	4.8	5.2				
Sphaeralcea coccinea	May 19 1976	June 23 1976	July 19 1976	August 17 1976				
PLOT 3-0								
Phenophase 1	9.0	8.0	8.0	3.0	100	89	100	38
Phenophase 7				4.0				50
Phenophase 8		1.0		1.0		11		12
Total	9.0	9.0	8.0	8.0				

Table B-3-37 (Continued)

	Mean No. of individuals per m^2 in each phenophase				Percent of Population			
	May 19 1976	June 23 1976	July 19 1976	August 17 1976	May	June	July	August
Sphaeralcea coccinea								
PLOT 3-F								
Phenophase 1	8.0	11.0	13.0	14.0	100	100	100	100
Phlox longifolia								
PLOT 3-0								
Phenophase 1	7.0	7.0	7.0		100	100	100	
Phenophase 7				2.0				29
Phenophase 8				5.0				71
Total	7.0	7.0	7.0	7.0				
PLOT 3-F								
Phenophase 1	14.0	7.0	5.0		100	47	33	
Phenophase 5		1.0				7		
Phenophase 7		4.0		3.0		27		20
Phenophase 8		3.0	10.0	12.0		20	67	80
Total	14.0	15.0	15.0	15.0				
Agropyron smithii								
PLOT 3-0								
Phenophase 1	129	151	157	142	100	97	97	89
Phenophase 3		2				1		
Phenophase 5			1				1	
Phenophase 6			1	2			1	1
Phenophase 7		1		9		1		6
Phenophase 8		1	2	6		1	1	4
Total	129	155	161	159				

Table B-3-37 (Continued)

	Mean No. of individuals per m^2 in each phenophase				Percent of Population			
					May	June	July	August
Agropyron smithii	May 19 1976	June 23 1976	July 19 1976	August 17 1976				
PLOT 3-F								
Phenophase 1	99	115	117	116	100	94	93	90
Phenophase 2		3	1			2	1	
Phenophase 5			2	1			2	1
Phenophase 7		4		4		3		3
Phenophase 8			6	8			5	6
Total	99	122	126	129				
PLOT 4-0		June 17		August 19				
Phenophase 1	23	26	24	15	100	100	100	60
Phenophase 8				10				40
Total	23	26	24	25				
PLOT 4-F								
Phenophase 1	11	14	14	11	100	100	100	79
Phenophase 7				3				21
Total	11	14	14	14				
Bromus tectorum								
PLOT 4-0								
Phenophase 1	124	15			100	9		
Phenophase 2		12				7		
Phenophase 3		14				9		
Phenophase 4		109				67		
Phenophase 6			24	12			24	12
Phenophase 7		2				1	76	
Phenophase 8		10	77	86		6		88
Total	124	162	101	98				

Table B-3-37 (Continued)

	Mean No. of individuals per m^2 in each phenophase				Percent of Population			
					May	June	July	August
Bromus tectorum	May 19 1976	June 17 1976	July 19 1976	August 19 1976				
PLOT 4-F								
Phenophase 1	185	0			100			
Phenophase 2		5				2		
Phenophase 3		10				4		
Phenophase 4		195				87		
Phenophase 6			77	48			36	22
Phenophase 7		9				4		
Phenophase 8		1	137	166		1	64	78
Total	185	220	214	214				
Oryzopsis hymenoides	May 15 1976	June 22 1976	July 19 1976	August 17 1976				
PLOT 5-0								
Phenophase 1	3.6	4.0	4.4	4.4	100	100	100	100
PLOT 5-F								
Phenophase 1	0.8	1.2	2.0	2.0	100	100	83	83
Phenophase 8			0.4	0.4			17	17
Total	0.8	1.2	2.4	2.4				

Table B-3-37 (Continued)

	Mean No. of individuals per m^2 in each phenophase				Percent of Population			
	May 15 1976	June 22 1976	July 19 1976	August 17 1976	May	June	July	August
Oryzopsis micrantha								
PLOT 5-0								
Phenophase 1	0.4	0.4	0.4	0.4	100	100	100	100
PLOT 5-F								
Phenophase 1	5.6	4.4	4.4	4.4	100	85	85	85
Phenophase 3		0.4				8		
Phenophase 4		0.4				8		
Phenophase 5			0.4				8	
Phenophase 6			0.4				8	
Phenophase 7				0.4				8
Phenophase 8				0.4				8
Total	5.6	5.2	5.2	5.2				
Phlox longifolia								
PLOT 6-0								
Phenophase 1	9.6	10.0	8.8	0.8	100	100	73	12
Phenophase 7				2.4				38
Phenophase 8			3.2	3.2			27	50
Total	9.6	10.0	12.0	6.4				
PLOT 6-F								
Phenophase 1	6.0	6.0	5.6	1.6	100	100	93	29
Phenophase 7				1.2				21
Phenophase 8			0.4	2.8			7	50
Total	6.0	6.0	6.0	5.6				

Table B-3-37 (Continued)

	Mean No. of individuals per m^2 in each phenophase				Percent of Population			
	May 15 1976	June 22 1976	July 20 1976	August 18 1976	May	June	July	August
(?) Festuca brachyphylla								
PLOT 6-0								
Phenophase 1	35.6	40.4	33.2	34.8	98	95	100	94
Phenophase 2	0.8				2			
Phenophase 3		0.4				1		
Phenophase 4		0.8				2		
Phenophase 6				2.0				6
Phenophase 7		0.4				1		
Phenophase 8		0.4				1		
Total	36.4	42.4	33.2	36.8				
PLOT 6-F								
Phenophase 1	46.4	53.6	54.4	51.2	100	95	100	89
Phenophase 2		1.2				2		
Phenophase 6				1.6				3
Phenophase 8		1.6		4.8		3		8
Total	46.4	56.4	54.4	57.6				
Agropyron smithii								
PLOT 6-0								
Phenophase 1	16.0	17.2	14.4	15.2	100	98	92	90
Phenophase 7				0.4				2
Phenophase 8		0.4	1.2	1.2		2	8	8
Total	16.0	17.2	15.6	16.8				
PLOT 6-F								
Phenophase 1	12.4	7.6	6.4	7.2	100	100	94	95
Phenophase 8			0.4	0.4			6	5
Total	12.4	7.6	6.8	7.6				

[1] Phenophases: 1 = vegetative stage; 2 = production of culms; 3 = flower and inflorescence buds; 4 = blossoming; 5 = unripe seeds and fruits; 6 = ripe seeds and dispersal; 7 = yellowing of leaves; 8 = death or partial dieback

Table B-3-38

MARKED TWIG MEASUREMENTS, 1974-1975

Species	Plot	$\bar{x}$ ± S.E. main twig length (mm) 9/74 (n=20)	$\bar{x}$ ± S.E. main twig length (mm) 6/75	$\bar{x}$ ± S.E. main twig length (mm) 9/75	$\bar{x}$ increase in main twig 9/74-9/75	$\bar{x}$ increase in lateral shoots 9/74-9/75	Total increase in twig length (main twig plus laterals) 9/74-9/75
Amelanchier alnifolia	1-F	87.1 ± 10.9	121.5 ± 15.5 n=19	128.3 ± 15.8 n=18	41.2	72.3 ± 21.7 n=14	113.5
	2-F	137.7 ± 11.6	173.3 ± 18.4 n=20	205.2 ± 25.0 n=20	67.5	110.4 ± 25.4 n=20	177.9
	5-F	41.6 ± 5.7	71.7 ± 10.5 n=20	75.6 ± 11.7 n=20	33.9	11.9 ± 4.2 n=20	45.8
	6-F	49.0 ± 11.2	72.4 ± 17.0 n=20	78.3 ± 18.1 n=20	29.3	19.6 ± 9.6 n=20	48.9
	1-0	90.4 ± 16.6	35.7 ± 8.4 n=14	36.2 ± 9.2 n=13	-54.2	120.6 ± 52.6 n=13	66.4
	2-0	149.8 ± 22.3	129.5 ± 24.5 n=17	152.5 ± 37.4 n=17	2.7	151.2 ± 49.3 n=17	153.9
	5-0	57.0 ± 7.8	54.4 ± 14.4 n=16	57.5 ± 16.2 n=16	0.5	16.9 ± 7.2 n=16	17.4
	6-0	66.7 ± 8.6	67.6 ± 13.7 n=20	73.8 ± 16.9 n=20	7.1	23.4 ± 7.6 n=20	30.5
Cercocarpus montanus	1-F	152.2 ± 20.0	156.5 ± 20.9 n=19	224.7 ± 35.1 n=19	72.4	186.4 ± 76.9 n=19	258.8
	2-F	186.1 ± 25.4	194.4 ± 25.2 n=20	266.0 ± 30.5 n=19	80.0	97.0 ± 44.2 n=19	177.0
	5-F	59.0 ± 8.4	60.4 ± 10.9 n=18	114.2 ± 29.1 n=18	55.1	30.7 ± 18.0 n=18	85.8
	1-0	94.2 ± 10.0	31.1 ± 12.1 n=13	60.9 ± 32.9 n=13	-33.3	36.5 ± 22.7 n=13	3.2
	2-0	200.5 ± 15.6	87.8 ± 17.8 n=18	89.7 ± 18.2 n=18	-110.8	177.9 ± 44.1 n=18	67.1
	5-0	72.2 ± 10.3	11.5 ± 4.3 n=15	38.5 ± 23.4 n=12	-33.7	12.2 ± 7.9 n=12	-21.5
Artemisia tridentata	3-F	32.8 ± 4.5	34.0 ± 5.8 n=19	42.1 ± 8.4 n=18	9.2	72.5 ± 32.0 n=18	81.7
	4-F	42.9 ± 6.5	50.4 ± 6.2 n=19	59.7 ± 7.7 n=17	16.7	65.8 ± 26.2 n=17	82.5
	3-0	26.5 ± 3.5	15.5 ± 6.2 n=12	17.5 ± 8.0 n=11	-9.0	26.2 ± 26.0 n=11	17.2
	4-0	57.6 ± 8.0	66.2 ± 10.6 n=18	72.4 ± 11.1 n=18	14.7	66.5 ± 39.4 n=18	81.2

Table B-3-39

MARKED TWIG MEASUREMENTS, 1976

Species	Plot	x̄ ± S.E. main twig length (mm) 5/76	x̄ ± S.E. main twig length (mm) 9/76	x̄ ± S.E. lateral length (mm) 5/76	x̄ lateral length 9/76	x̄ increase in main twig length 5/76-9/76	x̄ ± S.E. increase in lateral length (mm) 5/76-9/76	x̄ ± S.E. Total increase in stem length (mm) 5/76-9/76	x̄ ± S.E. decrease in lateral length (mm) 9/75-5/76	x̄ ± S.E. decrease in main twig length (mm) 9/75-5/76	x̄ ± S.E. Total decrease in length 9/75-5/76
Amelanchier spp.	1-F	125.4 ± 14.7 n=20	144.2 ± 16.8 n=18	74.7 ± 21.3 n=20	109.0 ± 29.8 n=18	13.3 ± 7.1 n=18	49.3 ± 17.7 n=18	62.6 ± 24.8 n=18	--	--	--
	2-F	203.8 ± 28.9 n=19	233.3 ± 33.7 n=19	111.8 ± 29.3 n=19	177.4 ± 41.0 n=19	29.5 ± 8.2 n=19	65.8 ± 16.9 n=19	95.3 ± 25.1 n=19	--	--	--
	5-F	81.2 ± 13.7 n=19	89.6 ± 16.5 n=19	14.0 ± 4.9 n=19	30.7 ± 8.5 n=19	8.4 ± 3.8 n=19	20.2 ± 5.4 n=19	28.6 ± 9.2 n=19	--	--	--
	6-F	90.5 ± 19.5 n=20	84.6 ± 20.8 n=20	30.0 ± 13.3 n=20	53.2 ± 15.5 n=20	-5.8 ± 6.3 n=20	32.9 ± 8.3 n=20	27.1 ± 14.6 n=20	--	--	--
	1-0	29.4 ± 4.6 n=10	31.1 ± 5.0 n=10	21.0 ± 10.2 n=10	29.9 ± 12.8 n=10	1.7 ± 0.9 n=10	8.9 ± 3.5 n=10	10.6 ± 4.4 n=10	92.6 ± 48.5 n=10	5.9 ± 4.8 n=10	98.5 ± 43.7 n=10
	2-0	119.6 ± 29.1 n=13	133.4 ± 28.2 n=13	134.5 ± 63.5 n=13	169.2 ± 63.0 n=13	13.8 ± 13.7 n=13	34.7 ± 13.7 n=13	48.5 ± 27.5 n=13	56.6 ± 20.8 n=14	14.8 ± 12.7 n=14	71.4 ± 35.5 n=14
	5-0	36.0 ± 14.8 n=14	41.2 ± 16.9 n=14	15.9 ± 10.0 n=14	33.7 ± 19.3 n=14	5.2 ± 2.7 n=14	19.6 ± 11.2 n=14	24.8 ± 13.7 n=14	2.4 ± 2.6 n=14	19.6 ± 15.1 n=14	22.0 ± 17.7 n=14
	6-0	79.2 ± 18.6 n=16	78.7 ± 21.8 n=16	35.9 ± 11.5 n=16	41.4 ± 13.2 n=16	-0.5 ± 7.0 n=16	14.9 ± 5.4 n=16	14.4 ± 12.4 n=16	-7.4 ± 4.3 n=16	6.5 ± 5.3 n=16	0.9 ± 9.6 n=16
Cercocarpus montanus	1-F	225.8 ± 35.9 n=19	230.2 ± 36.5 n=19	193.5 ± 75.9 n=19	194.3 ± 72.3 n=19	4.3 ± 1.4 n=19	6.1 ± 10.7 n=19	10.4 ± 12.1 n=19	--	--	--
	2-F	265.9 ± 30.6 n=19	268.3 ± 30.7 n=19	99.8 ± 47.1 n=19	125.6 ± 47.1 n=19	2.4 ± 1.4 n=19	36.4 ± 8.0 n=19	38.8 ± 9.4 n=19	--	--	--
	5-F	94.8 ± 25.8 n=14	97.3 ± 26.2 n=14	20.6 ± 14.0 n=14	45.6 ± 19.8 n=14	2.5 ± 1.6 n=14	26.1 ± 7.0 n=14	28.6 ± 8.6 n=14	6.8 ± 6.6 n=15	0.2 ± 0.2 n=15	7.0 ± 6.8 n=15
	1-0	11.25 ± 2.6 n=8	12.6 ± 2.7 n=8	6.5 ± 3.6 n=8	10.4 ± 8.0 n=8	1.4 ± 0.8 n=8	3.9 ± 5.2 n=8	5.2 ± 6.0 n=8	5.9 ± 6.0 n=8	33.0 ± 31.1 n=8	38.9 ± 37.1 n=8
	2-0	78.1 ± 16.9 n=17	78.8 ± 17.1 n=17	96.6 ± 33.2 n=17	141.3 ± 50.5 n=17	0.7 ± 1.0 n=17	46.8 ± 18.5 n=17	47.5 ± 19.5 n=17	86.0 ± 22.0 n=18	11.7 ± 6.6 n=18	97.7 ± 28.6 n=18
	5-0	8.5 ± 2.8 n=7	8.9 ± 3.1 n=7	1.1 ± 0.6 n=7	4.4 ± 2.4 n=7	0.3 ± 1.0 n=7	3.6 ± 2.4 n=7	3.9 ± 3.4 n=7	17.3 ± 11.1 n=8	2.3 ± 2.7 n=8	19.6 ± 12.8 n=8
Artemisia tridentata	3-F	34.4 ± 7.3 n=9	32.5 ± 7.1 n=9	79.7 ± 48.9 n=9	98.2 ± 50.0 n=9	-1.9 ± 1.1 n=9	18.6 ± 17.6 n=9	16.7 ± 18.7 n=9	--	--	--
	4-F	57.0 ± 7.6 n=17	54.8 ± 7.8 n=17	29.3 ± 9.1 n=17	72.0 ± 24.5 n=17	-1.6 ± 1.5 n=17	43.5 ± 16.9 n=17	41.9 ± 18.4 n=17	36.5 ± 21.5 n=17	2.7 ± 5.0 n=17	39.2 ± 24.5 n=17
	3-0	44.5 ± 16.1 n=4	44.5 ± 14.4 n=4	28.8 ± 28.8 n=4	38.8 ± 38.8 n=4	0.0 ± 1.7 n=4	10.0 ± 10.0 n=4	10.0 ± 11.7 n=4	42.8 ± 42.8 n=4	-1.0 ± 1.8 n=4	41.8 ± 44.6 n=4
	4-0	71.5 ± 12.3 n=15	73.1 ± 14.9 n=15	24.0 ± 12.9 n=15	39.5 ± 16.9 n=15	1.6 ± 3.6 n=15	16.4 ± 5.7 n=15	18.0 ± 9.3 n=15	14.8 ± 8.1 n=15	-5.2 ± 4.4 n=15	9.6 ± 12.5 n=15

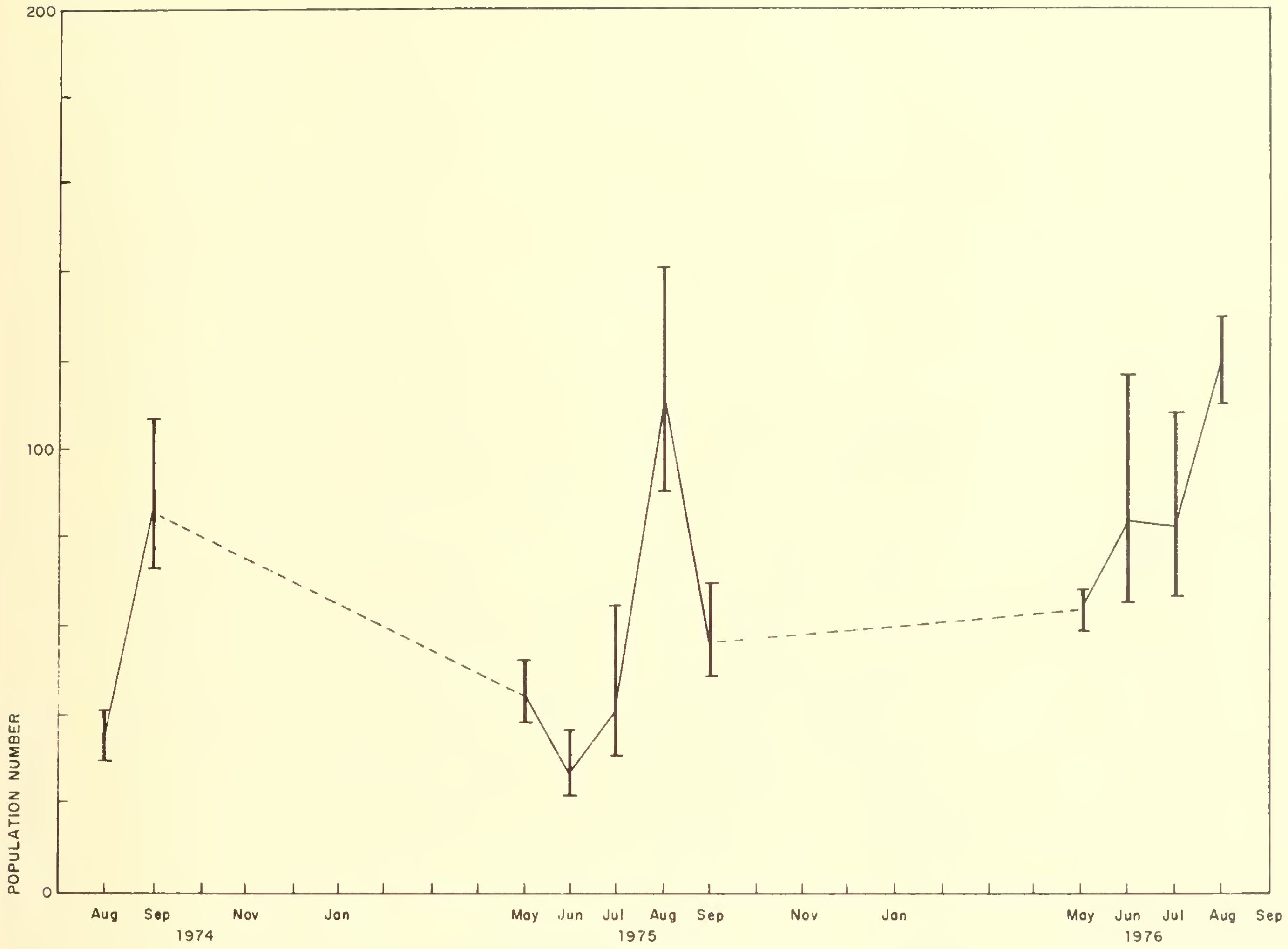

Figure B-4-1
POPULATION ESTIMATES WITH 95 PERCENT
CONFIDENCE INTERVALS FOR ALL SPECIES
COMBINED AT GRID 1 (CHAINED PINYON-
JUNIPER RANGELAND) EM-2 ESTIMATOR

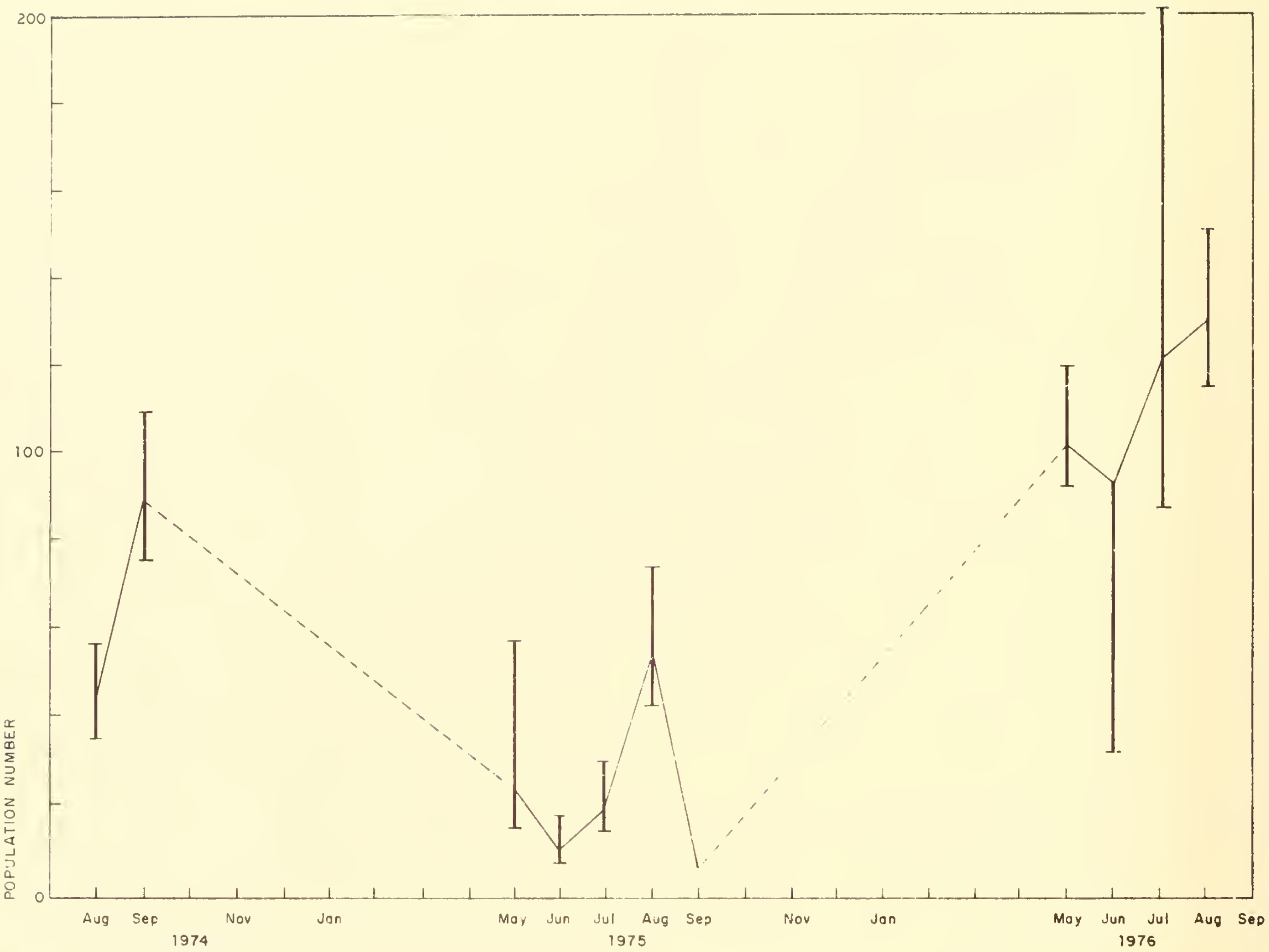

Figure B-4-2
POPULATION ESTIMATES WITH 95 PERCENT
CONFIDENCE INTERVALS FOR ALL SPECIES
COMBINED AT GRID 2 (PINYON-JUNIPER
WOODLAND) EM-2 ESTIMATOR

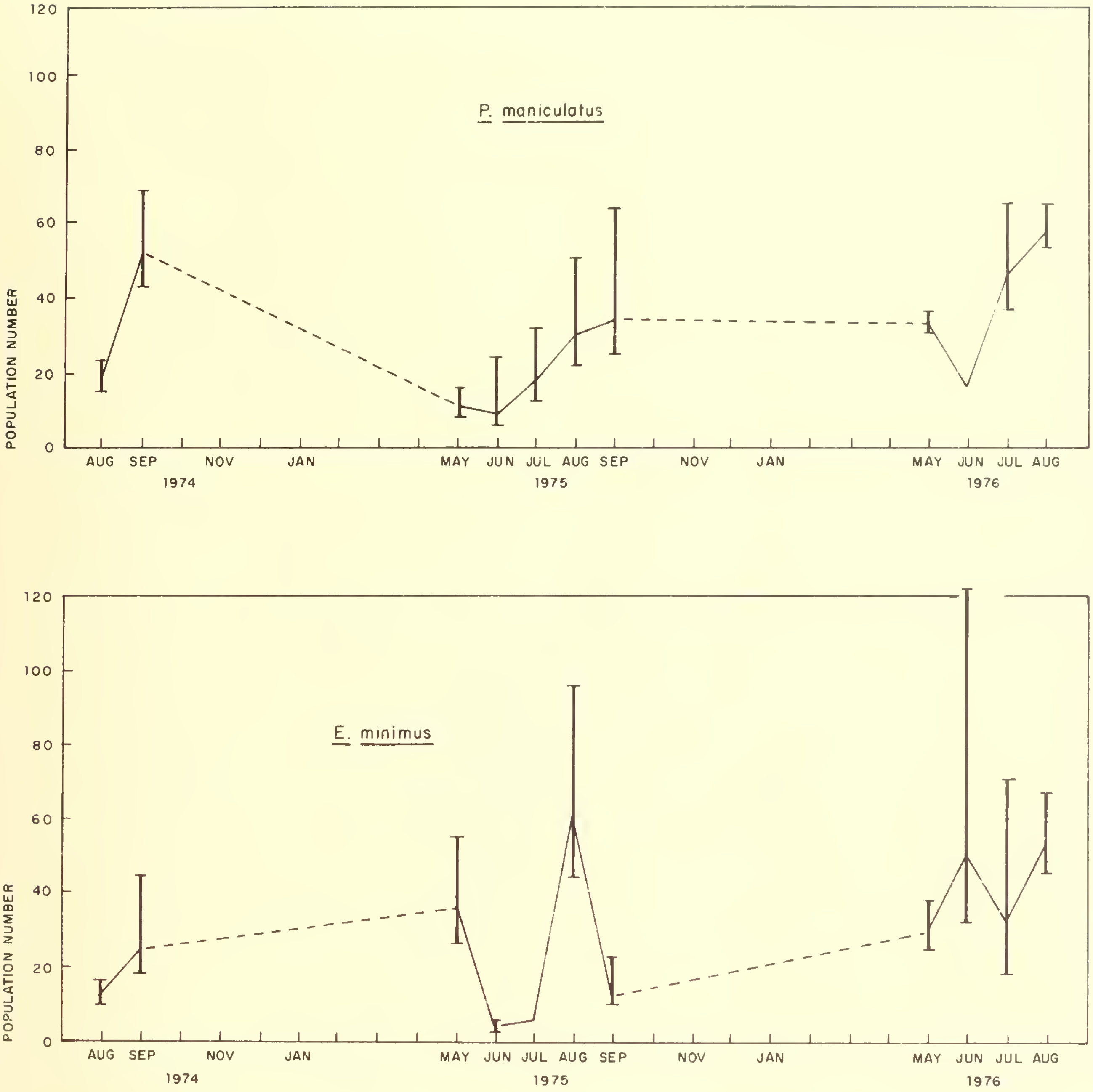

Figure B-4-3
POPULATION ESTIMATES WITH 95 PERCENT CONFIDENCE INTERVALS FOR TWO SPECIES AT GRID 1 (CHAINED PINYON-JUNIPER RANGELAND) EM-2 ESTIMATOR

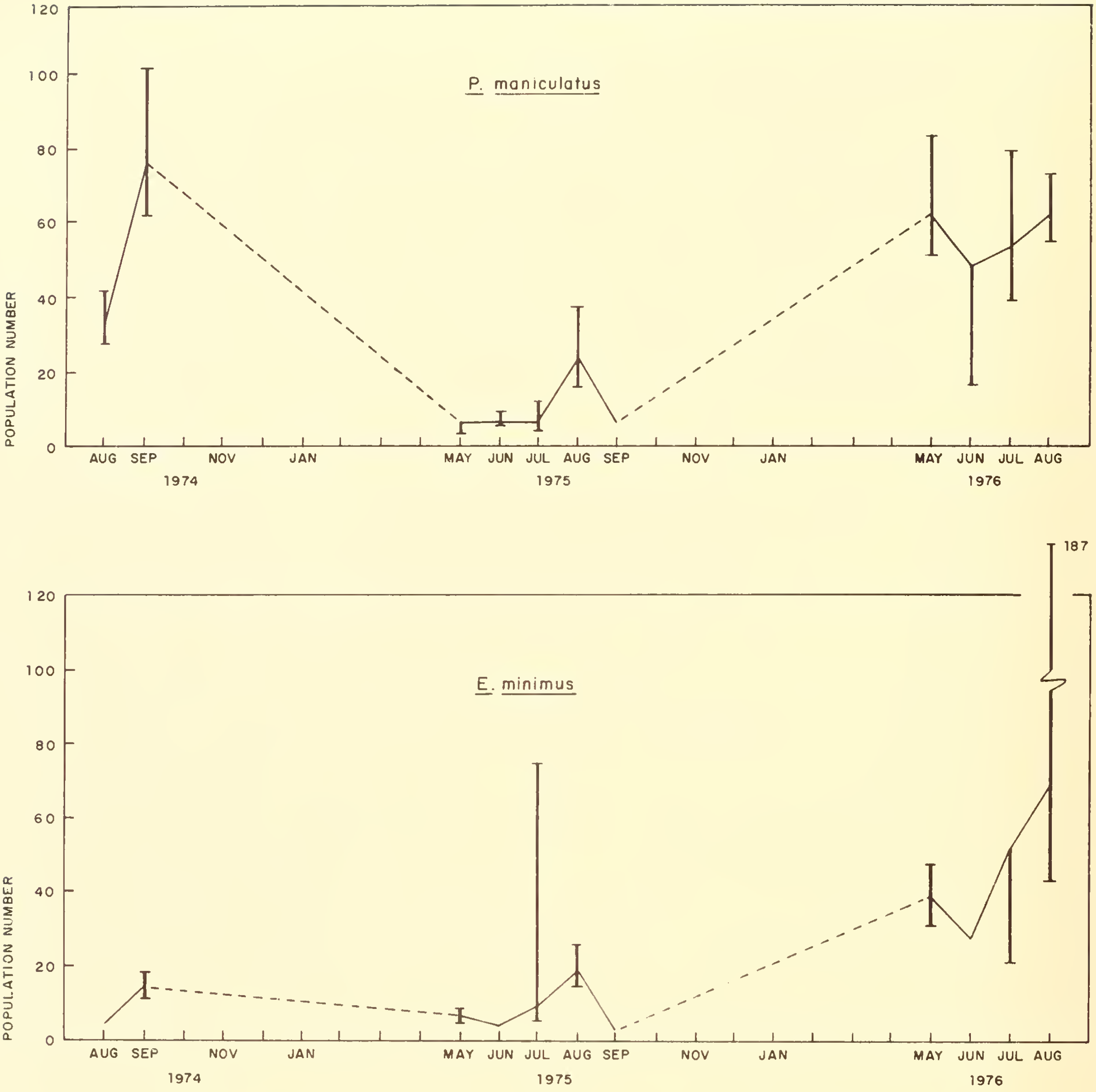

Figure B-4-4
POPULATION ESTIMATES WITH 95 PERCENT
CONFIDENCE INTERVALS FOR TWO SPECIES
AT GRID 2 (PINYON-JUNIPER WOODLAND)
EM-2 ESTIMATOR

Table B-4-1 BI-MONTHLY RESULTS OF TRACK COUNT STUDIES

		Percent Frequency (=No. plots with tracks : No. plots)									
Habitat Type	Sampling date No. of plots	Deer	Coyote	Cottontail	Jackrabbit	Porcupine	Bobcat	Long-tailed weasel	House cat	Raccoon	Skunk
	20 Oct. 74										
PJWD	20	100	0	0	5	5	0	0	0	0	0
CPJR	20	0	0	40	0	0	0	0	0	0	0
BLSB	20	30	0	30	0	0	0	0	0	0	0
AGMD	20	100	40	0	0	0	0	0	0	5	5
	14 Dec. 74										
PJWD	140	27	0	3.6	0	0	0	0	0	0	0
CPJR	100	6	3	7	0	0	0	0	0	0	0
BLSB	100	5	15	6	0	0	0	0	0	0	0
AGMD	100	0	0	3	0	0	0	0	0	0	0
	26 Feb. 75										
PJWD	60	58	0	0	1.7	0	0	0	0	0	0
CPJR	40	37.5	0	5	0	0	0	0	0	0	0
BLSB	--	--	--	--	--	-	-	-	-	-	-
AGMD	80	38	7.5	3.8	0	0	0	0	2.5	0	0
	3 May 75										
PJWD	20	25	10	10	0	0	0	0	0	0	0
CPJR	20	5	0	20	0	0	0	0	0	0	0
BLSB	20	10	0	40	0	0	0	0	0	0	0
AGMD	20	60	0	40	0	0	0	0	0	0	0
	14 Jul 75										
PJWD	19	0	0	31.6	0	0	0	0	0	0	0
CPJR	19	0	0	0	0	0	0	0	0	0	0
BLSB	19	0	15.8	73.7	0	0	5.3	0	0	0	0
AGMD	18	0	5.5	11.1	0	0	0	0	0	0	0
	30 Spt. 75										
PJWD	19	10	0	21	0	0	0	0	0	0	0
CPJR	21	0	0	9.5	0	0	0	0	0	0	0
BLSB	18	0	0	72	0	0	0	0	0	0	0
AGMD	17	0	29	24	0	0	0	0	0	0	0

Table B-4-1 (concluded)

Habitat Type	Sampling date No. of plots	Percent Frequency									
		Deer	Coyote	Cottontail	Jackrabbit	Porcupine	Bobcat	Long-tailed weasel	House cat	Raccoon	Skunk
	20 Nov. 75										
PJWD	100	21	1	3	0	0	0	0	0	0	0
CPJR	100	27	0	1	0	0	0	0	0	0	0
BLSB	100	18	1	3	0	0	0	0	0	0	0
AGMD	100	21	2	3	0	0	0	0	0	0	0
	25 Jan. 75										
PJWD	100	2	12	7	0	0	0	0	0	0	0
CPJR	100	2	1	2	0	0	0	1	0	0	0
BLSB	100	0	8	0	0	0	0	0	0	0	0
AGMD	100	2	1	0	0	0	0	0	0	0	0
	3 Mar. 76										
PJWD	100	0	0	0	0	0	0	1	0	0	0
CPJR	100	4	0	0	0	0	0	1	0	0	0
BLSB	100	8	0	0	0	0	0	0	0	0	0
AGMD	100	1	0	0	0	0	0	0	0	0	0
	19 May 76										
PJWD	16	18.7	12.5	0	0	0	0	0	0	0	0
CPJR	20	5	0	0	0	0	0	0	0	0	0
BLSB	20	0	0	40	0	0	0	0	0	0	0
AGMD	18	0	0	11	0	0	0	0	0	0	0
	14 Jul. 76										
PJWD	19	0	5.3	36.8	0	0	0	0	0	0	0
CPJR	20	0	0	10	0	0	0	0	0	0	0
BLSB	19	0	0	52.6	0	0	0	0	0	0	0
AGMD	20	0	0	15	0	0	0	0	0	0	0
	19 Spt. 76										
PJWD	20	15	0	50	0	0	0	0	0	0	0
CPJR	20	0	0	40	0	0	0	0	0	0	0
BLSB	20	0	15	75	0	0	0	0	0	0	0
AGMD	20	0	15	30	0	0	0	0	0	0	0

Table B-4-2 MAMMALS IDENTIFIED ON THE TRACT C-b STUDY AREA (TRACT C-b PLUS APPROXIMATELY A ONE-MILE SURROUNDING ZONE) NOMENCLATURE FOLLOWS ARMSTRONG (1972)

ORDER FAMILY Scientific name	Common name
INSECTIVORA	
Sorex cinereus	Masked shrew
S. vagrans	Wandering shrew
LAGOMORPHA	
Sylvilagus audubonii	Desert cottontail
Lepus townsendii	White-tailed jackrabbit
RODENTIA	
SCIURIDAE	
Eutamias minimus	Least chipmunk
E. umbrinus	Uinta chipmunk
Marmota flaviventris	Yellow-bellied marmot
Spermophilus lateralis	Golden-mantled ground squirrel
S. richardsonii	Richardson's ground squirrel
Tamiasciurus hudsonicus	Chickaree
GEOMYIDAE	
Thomomys talpoides	Northern pocket gopher
HETEROMYIDAE	
Perognathus apache	Apache pocket mouse

Table B-4-2 (Continued)

ORDER FAMILY Scientific name	Common name
CRICETIDAE	
Lagurus curtatus	Sagebrush vole
Microtus longicaudus	Long-tailed vole
M. montanus	Montane vole
M. pennsylvanicus	Meadow vole
Neotoma cinerea	Bushy-tailed woodrat
Ondatra zibethicus	Muskrat
Peromyscus maniculatus	Deer mouse
P. truei	Pinon mouse
CASTORIDAE	
Castor canadensis	Beaver
ZAPODIDAE	
Zapus princeps	Western jumping mouse
ERETHIZONTIDAE	
Erethizon dorsatum	Porcupine
CARNIVORA	
CANIDAE	
Canis latrans	Coyote
FELIDAE	
Lynx rufus	Bobcat

Table B-4-2 (Concluded)

ORDER FAMILY Scientific name	Common name
PROCYONIDAE	
Procyon lotor	Raccoon
MUSTELIDAE	
Mephitis mephitis	Striped skunk
Mustela erminea	Ermine
M. frenata	Long-tailed weasel
Taxidea taxus	Badger
ARTIODACTYLA	
Cervus canadensis	American elk
Odocoileus hemionus	Mule deer

Table B-4-3 NUMBER OF TRAP NIGHTS[1] FOR THE SATELLITE GRIDS, 1974 - 1976

	Satellite Grids								
Trapping Date	1	2	3	4	5	6	7	8	9
September 1974	24	24	24	24	24	24	24	0[2]	0
November 1974	24	24	24	24	24	24	24	0	0
January 1975	100	24	100	0	0	0	0	0	0
May 1975	72	72	72	72	72	72	72	72	72
June 1975	48	48	48	48	48	48	48	48	48
July 1975	48	48	48	48	48	0	48	48	48
August 1975	48	48	48	48	48	48	48	48	48
September 1975	48	48	72	72	48	48	72	72	48
November 1975	200	24	24	24	24	24	24	200	24
January 1976	48	0	0	0	0	0	0	48	0
March 1976	72	0	0	0	0	0	0	60	0
April 1976	36	10	24	0	24	10	0	20	0
June 1976	150	24	0	24	0	48	24	150	0
July 1976	150	24	0	24	24	24	24	150	0
August 1976	150	48	48	48	48	48	48	150	0

[1] Trap Nights = (No. of traps) x (No. of nights trap set)

[2] Indicates not trapped during this period

Table B-4-4 MEAN NUMBER OF EMBRYOS AND PLACENTAL SCARS IN FEMALES COLLECTED MAY-AUGUST 1975 ON GRIDS 1 (CHAINED PINYON-JUNIPER) AND 2 (PINYON-JUNIPER WOODLAND)

	Mean Number of Embryos		Mean Number of Placental Scars	
	Grid 1	Grid 2	Grid 1	Grid 2
Deer Mouse	5.0(N=13)	5.2(N=8)	12.0(N=4)	10.5(N=5)
Least Chipmunk	5.5(N=11)	5.1(N=7)	5.8(N=7)	5.4(N=6)

Table B-4-5 COMPARISON TESTS[1] ON HOME RANGE SIGMA VALUES FOR DEER MICE AND LEAST CHIPMUNKS FROM CHAINED PINYON-JUNIPER AND PINYON-JUNIPER WOODLAND GRIDS

	Comparison Test Value	Critical Value (α = .05)	Decision on Null
Chained Pinyon-Juniper Grid			
Peromyscus maniculatus			
Males vs. Females	0.656	2.110	Accept
Adult Males vs. Subadult Males	1.979	2.571	Accept
Eutamias minimus			
Males vs. Females	1.231	2.069	Accept
P. maniculatus vs. *E. minimus*	3.392	2.018	Reject
Pinyon-Juniper Woodland Grid			
Peromyscus maniculatus			
Males vs. Females	0.302	2.160	Accept
Adult Females vs. Subadult Females	2.569	2.365	Reject
Eutamias minimus			
Males vs. Females	1.586	2.306	Accept
P. maniculatus vs. *E. minimus*	2.595	2.056	Reject
Chained Pinyon-Juniper vs. Pinyon-Juniper Woodland			
Peromyscus maniculatus			
Males	0.026	2.160	Accept
Females	0.914	2.110	Accept
Eutamias minimus			
Males	0.751	2.131	Accept
Females	0.123	2.120	Accept

---

[1] t-test for comparison of two sample means

Table B-4-6 STATISTICAL TESTS FOR ANALYSIS-OF-VARIANCE AND MULTIPLE COMPARISONS[1] OF DIET ITEMS FOR PEROMYSCUS MANICULATUS AND EUTAMIAS MINIMUS ON GRIDS 1 AND 2, MAY 1975 - AUGUST 1976

Species/Grid/Date	Analysis of Variance Statistic	Critical Value	Decision	Multiple Comparison[2]
Peromyscus maniculatus				
CHAINED PINYON-JUNIPER				
May 1975	178.96	4.77	Reject	A ≠ V ≠ S
June 1975	102.44	7.26	Reject	A ≠ V ≠ S
July 1975	16.43	7.26	Reject	A ≠ V ≠ S
August 1975	22.53	7.26	Reject	(A = V) ≠ S
September 1975	---	---	---	Sample size too small for statistical analysis.
June 1976	---	---	---	Sample size too small for statistical analysis.
July 1976	40.04	4.77	Reject	V ≠ A ≠ S
August 1976	15.79	4.42	Reject	(A = V) ≠ S
PINYON-JUNIPER GRID				
May 1975	20.66	5.71	Reject	A ≠ (V = S)
June 1975	87.79	5.71	Reject	A ≠ V ≠ S
July 1975	9.59	4.15	Reject	(A = V) ≠ S
August 1975	28.52	5.71	Reject	A ≠ V ≠ S
September 1975	---	---	---	Sample size too small for statistical analysis.
June 1976	---	---	---	Sample size too small for statistical analysis.
July 1976	182.72	7.26	Reject	V ≠ A ≠ S
August 1976	29.65	4.24	Reject	A ≠ V ≠ S

Table B-4-6 (Concluded)

Species/Grid/Date	Analysis of Variance Statistic	Critical Value	Decision	Multiple Comparison[2]
Eutamias minimus				
CHAINED PINYON-JUNIPER				
May 1975	302.31	7.26	Reject	(V = A) ≠ S
June 1975	---	---	---	Sample size too small for statistical analysis.
July 1975	8.79	7.26	Reject	V ≠ (A = S)
August 1975	21.21	4.51	Reject	V ≠ A ≠ S
September 1975	1.62	7.26	Accept	No significant difference in diet items.
June 1976	33.47	4.56	Reject	V ≠ A ≠ S
July 1976	43.16	4.32	Reject	V ≠ A ≠ S
August 1976	21.98	5.10	Reject	V ≠ A ≠ S
PINYON-JUNIPER GRID				
May 1975	---	---	---	Sample size too small for statistical analysis.
June 1975	---	---	---	Sample size too small for statistical analysis.
July 1975	---	---	---	No sample available.
August 1975	13.01	4.51	Reject	V ≠ (A = S)
September 1975	---	---	---	No sample available.
June 1976	37.42	5.71	Reject	V ≠ (A = S)
July 1976	19.95	6.54	Reject	V ≠ A ≠ S
August 1976	22.09	7.26	Reject	V ≠ (A = S)

[1] (Zar, 1974) level of significance = .05
H_0: There is no difference in diet items

[2] A = Arthropods, V = Vegetation, S = Seeds,
Comparison is given in descending magnitude of sample means.

Table B-4-7 SPECIES OF BIRDS OBSERVED ON TRACT C-b DURING 11 CENSUS PERIODS OF THE TWO-YEAR BASELINE PROGRAM

ORDER FAMILY Species	Common Name	Season of Observation			
		Fall	Winter	Spring	Summer
PODICIPEDIFORMES (Grebes)					
PODICIPEDIDAE (Grebes)					
Podilymbus podiceps	Pied-billed grebe				x
ANSERIFORMES (Screamers, Swans, Geese, and Ducks)					
ANATIDAE (Swans, Geese, and Ducks)					
Anas platyrhynchos	Mallard	x	x	x	x
Anas strepera	Gadwall	x	x	x	
Anas acuta	Pintail	x			
Anas crecca	Green-winged teal	x	x	x	x
Anas discors	Blue-winged teal	x	x	x	x
Anas americana	American wigeon	x	x	x	
Anas clypeata	Northern shoveler	x			
Anas cyanoptera	Cinnamon teal			x	x
Aix sponsa	Wood duck			x	
Aythya collaris	Ring-necked duck			x	
Bucephala clangula	Common goldeneye		x	x	
Bucephala islandica	Barrow's goldeneye		x		
Bucephala albeola	Bufflehead		x		
Mergus serrator	Red-breasted merganser		x		
FALCONIFORMES (Vultures, Hawks, and Falcons)					
CATHARTIDAE (Vultures)					
Cathartes aura	Turkey vulture	x		x	x

Table B-4-7 (Continued)

ORDER FAMILY Species	Common Name	Season of Observation Fall	 Winter	 Spring	 Summer
FALCONIFORMES (Cont.)					
ACCIPITRIDAE (Kites, Hawks, and Eagles)					
Accipiter gentilis	Goshawk				x
Accipiter cooperii	Cooper's hawk				x
Accipiter striatus	Sharp-shinned hawk				x
Circus cyaneus	Marsh hawk	x	x	x	x
Buteo lagopus	Rough-legged hawk	x	x	x	
Buteo jamaicensis	Red-tailed hawk	x	x	x	x
Aquila chrysaetos	Golden eagle	x	x	x	x
Haliaeetus leucocephalus	Bald eagle		x	x	
FALCONIDAE (Caracaras and Falcons)					
Falco sparverius	American kestrel	x	x	x	x
Falco mexicanus	Prairie falcon	x	x	x	
GALLIFORMES (Chachalacas, Turkeys, Grouse, Quails, Partridges, and Pheasants)					
TETRAONIDAE (Grouse)					
Centrocercus urophasianus	Sage grouse	x			
GRUIFORMES (Cranes and Allies)					
GRUIDAE (Cranes)					
Grus canadensis	Sandhill crane	x			
RALLIDAE (Rails, Gallinules, and Coots)					
Fulica americana	American coot	x		x	x

Table B-4-7 (Continued)

ORDER FAMILY Species	Common Name	Season of Observation Fall	 Winter	 Spring	 Summer
CHARADRIIFORMES (Shorebirds, Gulls, Auks and Allies)					
CHARADRIIDAE (Plovers, Turnstones, and Surfbirds)					
Charadrius vociferus	Killdeer			x	x
SCOLOPACIDAE (Sandpipers)					
Capella gallinago	Common snipe	x	x	x	x
Actitis macularia	Spotted sandpiper			x	x
Tringa solitaria	Solitary sandpiper	x			x
Tringa flavipes	Lesser yellowlegs	x			x
Tringa melanoleuca	Greater yellowlegs			x	
RECURVIROSTRIDAE (Avocets and Allies)					
Recurvirostra americana	American avocet				x
PHALAROPODIDAE (Phalaropes)					
Steganopus tricolor	Wilson's phalarope			x	x
COLUMBIFORMES (Sand-grouse, Pigeons, and Doves)					
COLUMBIDAE (Pigeons and Doves)					
Zenaid macroura	Mourning dove	x		x	x
STRIGIFORMES (Owls)					
TYTONIDAE (Barn owls)					
Tyto alba	Barn owl	x			

Table B-4-7 (Continued)

ORDER FAMILY Species	Common Name	Season of Observation			
		Fall	Winter	Spring	Summer
STRIGIFORMES (Cont'd)					
STRIGIDAE (Typical owls)					
Otus asio	Screech owl		x		x
Bubo virginianus	Great horned owl	x	x	x	x
Asio otus	Long-eared owl		x		x
Asio flammeus	Short-eared owl		x		x
Nyctea scandiaca	Snowy owl		x		
Aegolius acadicus	Saw-whet owl				x
Glaucidium gnoma	Pygmy owl				x
CAPRIMULGIFORMES (Goatsuckers, Oilbirds, and Allies)					
CAPRIMULGIDAE (Goatsuckers)					
Phalaenoptilus nuttallii	Poor-will				x
Chordeiles minor	Common nighthawk	x			x
APODIFORMES (Swifts and Hummingbirds)					
APODIDAE (Swifts)					
Aeronautes saxatalis	White-throated swift				x
TROCHILIDAE (Hummingbirds)					
Selasphorus platycercus	Broad-tailed hummingbird				x
CORACIIFORMES (Kingfishers, Motmots, Rollers, Bee-eaters, and Hornbills)					
ALCEDINIDAE (Kingfishers)					
Megaceryle alcyon	Belted kingfisher	x		x	x

Table B-4-7 (Continued)

ORDER FAMILY Species	Common Name	Season of Observation			
		Fall	Winter	Spring	Summer
PICIFORMES (Woodpeckers, Jacamars, Toucans, and Barbets)					
PICIDAE (Woodpeckers and Wrynecks)					
Colaptes auratus	Common flicker	x	x	x	x
Sphyrapicus thyroideus	Williamson's sapsucker				x
Picoides villosus	Hairy woodpecker	x			x
Picoides pubescens	Downy woodpecker	x	x		x
PASSERIFORMES (Perching birds)					
TYRANNIDAE (Tyrant flycatchers)					
Tyrannus vociferans	Cassin's kingbird				x
Myiarchus cinerascens	Ash-throated flycatcher				x
Sayornis saya	Say's phoebe	x		x	x
Empidonax wrightii	Gray flycatcher	x			x
Empidonax difficilis	Western flycatcher	x			
Empidonax oberholseri	Dusky flycatcher				
Contopus sordidulus	Western wood pewee			x	x
Nuttallornis borealis	Olive-sided flycatcher				x
ALAUDIDAE (Larks)					
Eremophila alpestris	Horned lark	x	x		x
HIRUNDINIDAE (Swallows)					
Hirundo rustica	Barn swallow	x			x
Petrochelidon pyrrhonota	Cliff swallow	x			x
Tachycineta thalassina	Violet-green swallow	x			x
Iridoprocne bicolor	Tree swallow				x
Stelgidopteryx ruficollis	Rough-winged swallow			x	x

Table B-4-7 (Continued)

ORDER FAMILY Species	Common Name	Season of Observation Fall	 Winter	 Spring	 Summer
PASSERIFORMES (Cont.)					
CORVIDAE (Jays, Magpies, and Crows)					
Cyanocitta stelleri	Steller's jay	x	x		x
Aphelocoma coerulescens	Scrub jay	x	x	x	x
Gymnorhinus cyanocephalus	Pinyon jay	x	x	x	x
Pica pica	Black-billed magpie	x	x	x	x
Nucifraga columbiana	Clark's nutcracker	x	x	x	x
Corvus corax	Common raven	x	x	x	x
Corvus brachyrhynchos	Common crow	x			
PARIDAE (Chickadees, Titmice, Verdins, and Bushtits)					
Parus atricapillus	Black-capped chickadee	x	x	x	x
Parus gambeli	Mountain chickadee	x	x	x	x
Parus inornatus	Plain titmouse			x	x
SITTIDAE (Nuthatches)					
Sitta carolinensis	White-breasted nuthatch	x	x	x	x
Sitta canadensis	Red-breasted nuthatch	x	x		
TROGLODYTIDAE (Wrens)					
Troglodytes aedon	House wren	x			x
Salpinctes obsoletus	Rock wren	x		x	x
Catherpes mexicanus	Canyon wren	x		x	
MIMIDAE (Mockingbirds and Thrashers)					
Oreoscoptes montanus	Sage thrasher	x			x

Table B-4-7 (Continued)

ORDER FAMILY Species	Common Name	Season of Observation Fall	 Winter	 Spring	 Summer
PASSERIFORMES (Cont.)					
TURDIDAE (Thrushes, Solitaires, and Bluebirds)					
Turdus migratorius	American Robin	x	x	x	x
Myadestes townsendi	Townsend's solitaire	x	x	x	x
Catharas Guttatus	Hermit thrush				x
Sialia currucoides	Mountain bluebird	x		x	x
SYLVIIDAE (Gnatcatchers and Kinglets)					
Polioptila caerulea	Blue-gray gnatcatcher	x		x	x
Regulus calendula	Ruby-crowned kinglet	x			
MOTACILLIDAE (Wagtails and Pipits)					
Anthus spinoletta	Water pipit			x	
BOMBYCILLIDAE (Waxwings)					
Bombycilla garrulus	Bohemian waxwing		x		
LANIIDAE (Shrikes)					
Lanius excubitor	Northern shrike	x	x	x	
Lanius ludovicianus	Loggerhead shrike		x	x	
STURNIDAE (Starlings)					
Sturnus vulgaris	Starling	x		x	x
VIREONIDAE (Vireos)					
Vireo solitarius	Solitary vireo	x			x
Vireo olivaceus	Red-eyed vireo				x
Vireo gilvus	Warbling vireo				x

Table B-4-7 (Continued)

ORDER FAMILY Species	Common Name	Season of Observation Fall	 Winter	 Spring	 Summer
PASSERIFORMES (Cont.)					
PARULIDAE (Wood warblers)					
Vermivora celata	Orange-crowned warber				x
Vermivora virginiae	Virginia's warbler				x
Dendroica petechia	Yellow warbler				x
Dendroica coronata	Yellow-rumped warbler	x			x
Dendroica nigrescens	Black-throated gray warbler	x			x
Dendroica townsendi	Townsend's warbler	x			x
Geothlypis trichas	Common yellowthroat				x
Oporornis tolmiei	MacGillivray's warbler				x
Wilsonia pusilla	Wilson's warbler				x
ICTERIDAE (Blackbirds and Orioles)					
Dolichonyx oryzivorus	Bobolink				x
Sturnella neglecta	Western meadowlark	x		x	x
Agelaius phoeniceus	Red-winged blackbird	x	x	x	x
Xanthocephalus xanthocephalus	Yellow-headed blackbird	x			
Euphagus cyanocephalus	Brewer's blackbird	x		x	x
Molothrus ater	Brown-headed cowbird				x
THRAUPIDAE (Tanagers)					
Piranga ludoviciana	Western tanager				x
FRINGILLIDAE (Grosbeaks, Finches, Sparrows, and Buntings)					
Pheucticus melanocephalus	Black-headed grosbeak				x
Hesperiphona vespertina	Evening grosbeak		x	x	
Carpodacus mexicanus	House finch	x	x	x	x
Leucosticte tephrocotis	Gray-crowned rosy finch		x		

Table B-4-7 (Concluded)

ORDER FAMILY Species	Common Name	Season of Observation Fall	 Winter	 Spring	 Fall
PASSERIFORMES (Cont.)					
FRINGILLIDAE (Cont.)					
Leucosticte atrata	Black rosy finch		x		
Leucosticte australis	Brown-capped rosy finch		x		
Cardvelis pinus	Pine siskin	x			x
Cardvelis tristis	American goldfinch	x			
Loxia curvirostra	Red crossbill		x	x	
Pipilo chlorura	Green-tailed towhee	x		x	x
Pipilo erythrophthalmus	Rufous-sided towhee	x	x		x
Passerculus sandwichensis	Savannah sparrow	x			
Calamospiza melanocorys	Lark bunting				x
Pooecetes gramineus	Vesper sparrow	x		x	x
Amphispiza belli	Sage sparrow				x
Amphispiza bilineata	Black-throated sparrow				x
Junco hyemalis	Dark-eyed junco		x	x	
Junco caniceps	Gray-headed junco	x	x	x	x
Spizella arborea	Tree sparrow	x	x	x	
Spizella passerina	Chipping sparrow	x		x	x
Spizella breweri	Brewer's sparrow	x			x
Zonotrichia leucophrys	White-crowned sparrow	x			x
Melospiza melodia	Song sparrow	x	x	x	x

Table B-4-8

SHANNON-WEINER DIVERSITY INDICES (H'), UNBIASED ESTIMATES OF H' (E(H')), VARIANCE OF H' (VAR(H')), MAXIMUM EXPECTED VALUE OF H'(H'(MAX)), AND EQUITABILITY (J) FOR ALL AVIFAUNA TRANSECTS, 1974-1976

Sampling Date	Transect	Vegetation Type	H'	E(H')	var(H')	H'(max)	J
October 1974	1	Chained pinyon-juniper rangeland	1.116	1.071	0.015	1.386	0.805
	2	Riparian meadow	1.464	1.441	0.003	2.303	0.636
	3	Bottomland sagebrush	1.426	1.385	0.010	1.946	0.733
	4	Pinyon-juniper woodland	1.277	1.221	0.009	1.386	0.921
	5A	Pinyon-juniper woodland	0.673	0.559	0.028	0.693	0.971
	6	Canyon sagebrush	0.000	0.000	0.000	0.000	-
	7A	Upland sagebrush	-	-	-	-	-
	8	Mixed mountain shrub	1.034	1.014	0.003	1.099	0.941
November 1974	1	Chained pinyon-juniper rangeland	0.693	0.339	0.125	0.693	1.000
	2	Riparian meadow	1.320	1.311	0.001	1.609	0.820
	3	Bottomland sagebrush	0.637	0.417	0.091	0.693	0.918
	4	Pinyon-juniper woodland	0.686	0.634	0.006	0.693	0.990
	5A	Pinyon-juniper woodland	-	-	-	-	-
	6	Canyon sagebrush	-	-	-	-	-
	7A	Upland sagebrush	-	-	-	-	-
	8	Mixed mountain shrub	-	-	-	-	-

Table B-4-8 (continued)

Sampling Date	Transect	Vegetation Type	H'	E(H')	var(H')	H'(max)	J
January 1975	1	Chained pinyon-juniper rangeland	-	-	-	-	-
	2	Riparian meadow	1.280	1.274	0.001	1.386	0.923
	3	Bottomland sagebrush	0.924	0.895	0.007	1.099	0.841
	4	Pinyon-juniper woodland	1.467	1.447	0.004	1.792	0.818
	5A	Pinyon-juniper woodland	0.815	0.798	0.010	1.386	0.588
	6	Canyon sagebrush	0.878	0.867	0.003	1.609	0.546
	7A	Upland sagebrush	-	-	-	-	-
	8	Mixed mountain shrub	1.442	1.430	0.002	1.792	0.805
March 1975	1	Chained pinyon-juniper rangeland	-	-	-	-	-
	2	Riparian meadow	0.658	0.605	0.031	1.386	0.475
	3	Bottomland sagebrush	1.273	1.074	0.042	1.386	0.918
	4	Pinyon-juniper woodland	0.673	0.559	0.028	0.693	0.971
	5A	Pinyon-juniper woodland	-	-	-	-	-
	6	Canyon sagebrush	-	-	-	-	-
	7A	Upland sagebrush	-	-	-	-	-
	8	Mixed mountain shrub	-	-	-	-	-
May 1975	1	Chained pinyon-juniper rangeland	2.007	1.928	0.012	2.565	0.783
	2	Riparian meadow	2.401	2.348	0.004	2.833	0.847
	3	Bottomland sagebrush	2.120	2.062	0.007	2.485	0.853
	4	Pinyon-juniper woodland	2.070	2.027	0.007	2.565	0.807
	5A	Pinyon-juniper woodland	1.826	1.760	0.012	2.398	0.761

Table B-4-8 (continued)

Sampling Date	Transect	Vegetation Type	H'	E(H')	var(H')	H'(max)	J
May 1975 (Con't)	6	Canyon sagebrush	1.980	1.908	0.007	2.197	0.901
	7A	Upland sagebrush	1.804	1.763	0.009	2.303	0.784
	8	Mixed mountain shrub	1.613	1.554	0.008	1.792	0.900
July 1975	1	Chained pinyon-juniper rangeland	1.479	1.450	0.008	1.946	0.760
	2	Riparian meadow	2.141	2.095	0.004	2.398	0.893
	3	Bottomland sagebrush	1.695	1.631	0.015	2.398	0.707
	4	Pinyon-juniper woodland	1.741	1.716	0.006	2.197	0.792
	5A	Pinyon-juniper woodland	-	-	-	-	-
	6	Canyon sagebrush	-	-	-	-	-
	7A	Upland sagebrush	-	-	-	-	-
	8	Mixed mountain shrub	-	-	-	-	-
September 1975	1	Chained pinyon-juniper rangeland	1.191	1.162	0.007	2.303	0.517
	2	Riparian meadow	1.610	1.578	0.004	1.792	0.899
	3	Bottomland sagebrush	1.589	1.556	0.006	2.398	0.663
	4	Pinyon-juniper woodland	1.195	1.171	0.006	2.773	0.431
	5A	Pinyon-juniper woodland	0.983	0.826	0.069	1.386	0.709
	6	Canyon sagebrush	1.401	1.350	0.010	1.792	0.782
	7A	Upland sagebrush	1.465	1.389	0.016	1.792	0.818
	8	Mixed mountain shrub	1.127	0.973	0.044	1.386	0.813

Table B-4-8 (continued)

Sampling Date	Transect	Vegetation Type	H'	E(H')	var(H')	H'(max)	J
February 1976	1	Chained pinyon-juniper rangeland	1.348	1.196	0.029	1.609	0.838
	2	Riparian meadow	0.370	0.157	0.077	1.099	0.337
	3	Bottomland sagebrush	0.921	0.216	0.263	1.099	0.839
	4	Pinyon-juniper woodland	1.671	1.608	0.008	2.639	0.633
	5B	Pinyon-juniper woodland	0.316	0.306	0.002	2.303	0.137
	6	Canyon sagebrush	1.078	1.061	0.005	1.946	0.554
	7B	Upland transition	1.716	1.626	0.013	1.946	0.882
	8	Mixed mountain shrub	0.861	0.826	0.015	1.099	0.784
April 1976	1	Chained pinyon-juniper rangeland	1.511	1.225	0.032	1.792	0.843
	2	Riparian meadow	1.152	1.107	0.009	1.946	0.592
	3	Bottomland sagebrush	1.233	0.993	0.054	1.792	0.688
	4	Pinyon-juniper woodland	1.455	1.356	0.015	2.079	0.700
	5B	Pinyon-juniper woodland	1.878	1.743	0.018	2.639	0.712
	6	Canyon sagebrush	1.924	1.810	0.010	2.079	0.925
	7B	Upland transition	1.477	1.351	0.026	1.792	0.825
	8	Mixed mountain shrub	-	-	-	-	-
June 1976	1	Chained pinyon-juniper rangeland	1.994	1.920	0.008	2.639	0.756
	2	Riparian meadow	2.101	1.968	0.011	2.996	0.701
	3	Bottomland sagebrush	2.123	1.944	0.027	2.773	0.766
	4	Pinyon-juniper woodland	2.444	2.266	0.013	3.135	0.779
	5B	Pinyon-juniper woodland	2.794	2.682	0.005	3.219	0.868

Table B-4-8 (concluded)

Sampling Date	Transect	Vegetation Type	H'	E(H')	var(H')	H'(max)	J
June 1976 (Con't)	6	Canyon sagebrush	2.544	2.443	0.007	2.833	0.898
	7B	Upland transition	2.168	2.095	0.005	2.398	0.904
	8	Mixed mountain shrub	2.164	2.089	0.008	2.565	0.844
July 1976	1	Chained pinyon-juniper rangeland	1.441	1.390	0.008	1.609	0.895
	2	Riparian meadow	1.736	1.678	0.009	2.398	0.724
	3	Bottomland sagebrush	0.869	0.843	0.008	1.099	0.791
	4	Pinyon-juniper woodland	1.445	1.370	0.007	1.609	0.898
	5B	Pinyon-juniper woodland	-	-	-	-	-
	6	Canyon sagebrush	-	-	-	-	-
	7B	Upland transition	-	-	-	-	-
	8	Mixed mountain shrub	-	-	-	-	-

Table B-4-9

RESULTS OF STRIP TRANSECT CENSUSES OF
BIRDS CONDUCTED DURING OCTOBER 1974

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
1 Chained pinyon-juniper rangeland	Townsend's solitaire	3	1.000	*	0.15	8.6
	Mountain bluebird	4	*	*	0.20	11.4
	Yellow-rumped warbler	4	0.500	*	0.41	22.9
	Gray-headed junco	5	0.250	*	1.02	57.1
		Total			1.79	
2 Riparian meadow	Mourning dove	11	*	*	0.56	4.8
	Black-billed magpie	4	*	*	0.20	1.8
	Robin	1	*	*	0.05	0.4
	Townsend's solitaire	1	1.000	*	0.05	0.4
	Starling	1	*	*	0.05	0.4
	Yellow-rumped warbler	3	*	*	0.15	1.3
	Red-winged blackbird	61	*	*	3.13	26.8
	House finch	1	0.500	*	0.10	0.9
	White-crowned sparrow	20	0.250	*	4.10	35.1
	Song sparrow	4	0.063	*	3.28	28.1
		Total			11.68	

Table B-4-9 (continued)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
3 Bottomland sagebrush	Steller's jay	1	*	*	0.05	1.2
	Black-capped chickadee	1	0.250	*	0.20	5.0
	Rock wren	2	0.563	*	0.18	4.4
	Townsend's solitaire	9	1.000	*	0.46	11.2
	Mountain bluebird	21	0.528	*	2.04	49.4
	Yellow-rumped warbler	3	0.156	*	0.98	23.8
	White-crowned sparrow	2	0.500	*	0.20	5.0
		Total			4.13	
4 Pinyon-juniper woodland	Black-capped chickadee	1	0.250	*	0.20	14.3
	Robin	1	0.125	*	0.41	28.6
	Townsend's solitaire	5	0.417	*	0.61	42.9
	Mountain bluebird	1	0.250	*	0.20	14.3
		Total			1.43	
5A Pinyon-juniper woodland	Townsend's solitaire	3	1.000	*	0.15	60.0
	Gray-headed junco	1	0.500	*	0.10	40.0
		Total			0.26	

Table B-4-9 (concluded)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
6 Canyon sagebrush	Mountain bluebird	1	1.000	*	0.05	100.0
		Total			0.05	
7A Upland sagebrush			No birds were observed			
8 Mixed mountain shrub	Western flycatcher	1	0.125	1.2	0.49	19.4
	Mountain chickadee	6	0.250	*	1.23	48.4
	Ruby-crowned kinglet	4	0.250	*	0.82	32.3
		Total			2.54	

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[1] Coefficient detectability

[2] Basal detectability adjustment

Table B-4-10

RESULTS OF STRIP TRANSECT CENSUSES OF BIRDS CONDUCTED DURING NOVEMBER 1974

	Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
1	Chained pinyon-juniper rangeland	Robin	1	1.000	*	0.05	50.0
		Townsend's solitaire	1	1.000	*	0.05	50.0
			Total			0.10	
2	Riparian meadow	Robin	86	*	*	4.41	38.6
		Starling	48	*	*	2.46	21.5
		Red-winged blackbird	1	*	*	0.05	0.4
		White-crowned sparrow	4	0.167	*	1.23	10.8
		Song sparrow	11	0.172	*	3.28	28.7
			Total			11.42	
3	Bottomland sagebrush	Black-billed magpie	2	*	*	0.10	66.7
		Northern shrike	1	*	*	0.05	33.3
			Total			0.15	
4	Pinyon-juniper woodland	White-breasted nuthatch	2	0.350	*	0.29	55.9
		Townsend's solitaire	3	0.667	*	0.23	44.1
			Total			0.52	

Table B-4-10 (concluded)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
5A Pinyon-juniper woodland			Transect was not sampled			
6 Canyon sagebrush			Transect was not sampled			
7A Upland sagebrush			Transect was not sampled			
8 Mixed mountain shrub			Transect was not sampled			

[1] Coefficient detectability

[2] Basal detectability adjustment

Table B-4-11

RESULTS OF STRIP TRANSECT CENSUSES OF BIRDS CONDUCTED DURING JANUARY 1975

	Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
1	Chained pinyon-juniper rangeland			No birds were observed			
2	Riparian meadow	Horned lark	55	0.519	*	5.43	45.8
		Robin	42	*	*	2.15	18.2
		Tree sparrow	19	0.393	*	2.48	20.9
		Song sparrow	6	0.172	*	1.79	15.1
			Total			11.85	
3	Bottomland sagebrush	Robin	15	1.000	*	0.77	42.9
		Northern shrike	3	*	*	0.15	8.6
		Tree sparrow	17	*	*	0.87	48.6
			Total			1.79	
4	Pinyon-juniper woodland	Pinyon jay	12	0.600	*	1.02	15.0
		Mountain chickadee	7	0.200	*	1.79	26.3
		Plain titmouse	3	0.250	*	0.61	9.0

Table B-4-11 (continued)

Transect		Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
4	Pinyon-juniper woodland (Continued)	White-breasted nuthatch	2	0.350	*	0.29	4.3
		Red-breasted nuthatch	17	0.304	*	2.87	42.0
		Townsend's solitaire	3	0.667	*	0.23	3.4
			Total			6.82	
5A	Pinyon-juniper woodland	Pinyon jay	67	*	*	3.43	75.3
		Townsend's solitaire	4	1.000	*	0.20	4.5
		Dark-eyed junco	1	0.125	*	0.41	9.0
		Gray-headed junco	5	0.500	*	0.51	11.2
			Total			4.56	
6	Canyon sagebrush	Common flicker	1	*	*	0.05	0.5
		Townsend's solitaire	2	1.000	*	0.10	0.9
		Gray-crowned rosy finch	142	1.000	*	7.27	67.3
		Black rosy finch	49	1.000	*	2.51	23.2
		Brown-capped rosy finch	17	1.000	*	0.87	8.1
			Total			10.81	

Table B-4-11 (concluded)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
7A Upland sagebrush			No birds were observed			
8 Mixed mountain shrub	Mountain chickadee	7	0.188	*	1.91	17.9
	Plain titmouse	2	0.063	*	1.64	15.3
	Robin	3	1.000	*	0.15	1.4
	Townsend's solitaire	3	1.000	*	0.15	1.4
	Dark-eyed junco	7	0.094	*	3.82	35.8
	Gray-headed junco	10	0.171	*	3.00	28.1
		Total			10.69	

[1] Coefficient detectability

[2] Basal detectability adjustment

Table B-4-12

RESULTS OF STRIP TRANSECT CENSUSES OF BIRDS CONDUCTED DURING MARCH 1975

	Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
1	Chained pinyon-juniper rangeland			No birds were observed			
2	Riparian meadow	Scrub jay	1	*	*	0.05	3.0
		Common raven	2	*	*	0.10	6.1
		Starling	3	*	*	0.15	9.1
		Red-winged blackbird	27	*	*	1.38	81.8
			Total			1.69	
3	Bottomland sagebrush	Black-billed magpie	1	*	*	0.05	11.1
		Mountain chickadee	1	0.500	*	0.10	22.2
		Townsend's solitaire	2	1.000	*	0.10	22.2
		Song sparrow	1	0.250	*	0.20	44.4
			Total			0.46	
4	Pinyon-juniper woodland	Black-billed magpie	2	*	*	0.10	40.0
		Townsend's solitaire	3	1.000	*	0.15	60.0
			Total			0.26	

Table B-4-12 (concluded)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
5A Pinyon-juniper woodland			Transect was not sampled			
6 Canyon sagebrush			Transect was not sampled			
7A Upland sagebrush			Transect was not sampled			
8 Mixed mountain shrub			Transect was not sampled			

[1] Coefficient detectability

[2] Basal detectability adjustment

Table B-4-13

RESULTS OF STRIP TRANSECT CENSUSES OF BIRDS CONDUCTED DURING MAY 1975

	Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
1	Chained pinyon-juniper rangeland	Broad-tailed hummingbird	2	0.250	*	0.41	9.4
		Common flicker	2	*	*	0.10	2.3
		Tree swallow	1	*	*	0.05	1.2
		Common raven	1	*	*	0.05	1.2
		House wren	5	0.625	*	0.41	9.4
		Mountain bluebird	2	*	*	0.10	2.3
		Blue-gray gnatcatcher	1	0.333	*	0.15	3.5
		Yellow-rumped warbler	4	0.125	*	1.64	37.6
		Green-tailed towhee	3	0.500	*	0.31	7.0
		Vesper sparrow	2	0.518	*	0.20	4.5
		Chipping sparrow	3	1.000	*	0.15	3.5
		Brewer's sparrow	4	0.279	*	0.73	16.8
		White-crowned sparrow	1	1.000	*	0.05	1.2
			Total			4.36	
2	Riparian meadow	Mourning dove	2	*	*	0.10	1.2
		Broad-tailed hummingbird	2	0.125	*	0.82	9.6
		Western wood peewee	1	*	*	0.05	0.6
		Olive-sided flycatcher	1	0.125	*	0.41	4.8
		Cliff swallow	10	*	*	0.51	6.0
		Tree swallow	11	*	*	0.56	6.6

Table B-4-13 (continued)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
2 Riparian meadow (Continued)	Rough-winged swallow	8	*	*	0.41	4.8
	Common raven	1	*	*	0.05	0.6
	House wren	1	1.000	*	0.05	0.6
	Robin	2	*	*	0.10	1.2
	Mountain bluebird	1	*	*	0.05	0.6
	Yellow-rumped warbler	12	*	*	0.61	7.2
	Red-winged blackbird	42	*	*	2.15	25.3
	Brewer's blackbird	11	*	*	0.56	6.6
	Pine siskin	9	1.000	*	0.46	5.4
	Chipping sparrow	3	0.313	*	0.49	5.8
	Song sparrow	3	0.141	*	1.09	12.9
		Total			8.50	
3 Bottomland sagebrush	White-throated swift	4	*	*	0.20	3.9
	Common flicker	1	*	*	0.05	1.0
	Cliff swallow	3	*	*	0.15	3.0
	Tree swallow	7	*	*	0.36	6.9
	Rock wren	2	0.500	*	0.20	3.9
	Mountain bluebird	4	0.577	*	0.36	6.8
	Blue-gray gnatcatcher	3	0.500	*	0.31	5.9
	Virginia's warbler	1	0.500	*	0.10	2.0

Table B-4-13 (continued)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
3 Bottomland sagebrush (Continued)	Yellow-rumped warbler	8	0.500	*	0.82	15.8
	Black-throated gray warbler	4	0.125	*	1.64	31.5
	Green-tailed towhee	3	0.375	*	0.41	7.9
	Brewer's sparrow	4	0.344	*	0.60	11.4
		Total			5.20	
4 Pinyon-juniper woodland	Mourning dove	5	*	*	0.26	3.4
	Broad-tailed hummingbird	1	0.250	*	0.20	2.7
	Cliff swallow	2	*	*	0.10	1.4
	Mountain chickadee	2	0.500	*	0.20	2.7
	White-breasted nuthatch	1	0.667	*	0.08	1.0
	House wren	2	0.250	*	0.41	5.5
	Hermit thrush	2	0.500	1.5	0.31	4.1
	Warbling vireo	3	0.190	*	0.81	10.8
	Black-throated gray warbler	8	0.500	*	0.82	10.9
	House finch	1	0.306	*	0.17	2.2
	Pine siskin	7	0.352	*	1.02	13.6
	Green-tailed towhee	3	0.375	*	0.41	5.5
	Chipping sparrow	5	0.094	*	2.73	36.3
		Total			7.52	

Table B-4-13 (continued)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
5A Pinyon-juniper woodland	White-throated swift	1	*	*	0.05	1.2
	Broad-tailed hummingbird	2	0.292	*	0.35	8.0
	Common flicker	2	*	*	0.10	2.3
	Gray flycatcher	1	0.333	1.5	0.23	5.3
	Western wood peewee	2	0.063	*	1.64	37.5
	Pinyon jay	2	1.000	*	0.10	2.3
	Common raven	1	*	*	0.05	1.2
	House wren	3	0.571	*	0.27	6.2
	Mountain bluebird	4	0.528	*	0.39	8.9
	Black-throated gray warbler	1	0.500	*	0.10	2.3
	Chipping sparrow	5	0.236	*	1.08	24.8
		Total			4.37	
6 Canyon sagebrush	Broad-tailed hummingbird	1	0.250	*	0.20	6.7
	Cliff swallow	3	*	*	0.15	5.0
	Violet-green swallow	7	*	*	0.36	11.7
	Tree swallow	1	*	*	0.05	1.7
	Mountain bluebird	6	0.500	*	0.61	20.0
	Yellow-rumped warbler	4	0.500	*	0.41	13.3
	Green-tailed towhee	2	0.500	*	0.20	6.7

Table B-4-13 (continued)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
6 Canyon sagebrush (Continued)	Vesper sparrow	3	0.188	*	0.82	26.7
	Brewer's sparrow	5	1.000	*	0.26	8.3
		Total			3.07	
7A Upland sagebrush	Broad-tailed hummingbird	2	0.156	*	0.66	11.2
	Ash-throated flycatcher	1	0.250	*	0.20	3.5
	Say's phoebe	3	0.500	*	0.31	5.3
	Mountain chickadee	2	1.000	*	0.10	1.8
	Mountain bluebird	5	*	*	0.26	4.4
	Yellow-rumped warbler	2	0.500	*	0.20	3.5
	Green-tailed towhee	4	0.375	*	0.55	9.4
	Vesper sparrow	14	0.274	*	2.62	44.8
	Chipping sparrow	2	0.500	*	0.20	3.5
	Brewer's sparrow	5	0.344	*	0.74	12.7
		Total			5.84	
8 Mixed mountain shrub	White-throated swift	3	*	*	0.15	6.7
	Broad-tailed hummingbird	1	0.250	*	0.20	8.9
	Blue-gray gnatcatcher	4	0.283	*	0.72	31.5

Table B-4-13 (concluded)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
8 Mixed mountain shrub (Continued)	Macgillivray's warbler	2	0.313	1.5	0.49	21.4
	Green-tailed towhee	4	0.355	*	0.58	25.1
	Vesper sparrow	1	0.350	*	0.15	6.4
		Total			2.30	

[1] Coefficient detectability

[2] Basal detectability adjustment

Table B-4-14

RESULTS OF STRIP TRANSECT CENSUSES OF BIRDS CONDUCTED DURING JULY 1975

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
1 Chained pinyon-juniper rangeland	Mourning dove	4	*	*	0.20	3.7
	Common flicker	4	*	*	0.20	3.7
	House wren	5	0.094	*	2.73	49.2
	Mountain bluebird	3	*	*	0.15	2.8
	Green-tailed towhee	3	0.375	*	0.41	7.4
	Vesper sparrow	4	0.250	*	0.82	14.8
	Brewer's sparrow	7	0.350	*	1.02	18.5
		Total			5.55	
2 Riparian meadow	Broad-tailed hummingbird	1	0.250	1.5	0.31	5.4
	Say's phoebe	3	0.250	*	0.61	10.7
	Barn swallow	2	*	*	0.10	1.8
	Cliff swallow	6	*	*	0.31	5.4
	Rough-winged swallow	3	*	*	0.15	2.7
	Mountain bluebird	3	*	*	0.15	2.7
	Common yellowthroat	1	0.063	*	0.82	14.3
	Western meadowlark	2	0.250	*	0.41	7.1
	Red-winged blackbird	28	*	*	1.43	25.0

Table B-4-14 (continued)

	Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
2	Riparian meadow (Continued)	Chipping sparrow	3	0.250	1.5	0.92	16.1
		Song sparrow	5	0.500	*	0.51	8.9
			Total			5.74	
3	Bottomland sagebrush	Mourning dove	2	*	*	0.10	2.3
		White-throated swift	1	*	*	0.05	1.1
		Common flicker	1	*	*	0.05	1.1
		Cliff swallow	3	*	*	0.15	3.4
		House wren	1	0.250	*	0.20	4.6
		Rock wren	2	0.500	*	0.20	4.6
		Blue-gray gnatcatcher	3	0.250	*	0.61	13.8
		Yellow-rumped warbler	1	0.125	*	0.41	9.2
		Brown-headed cowbird	2	*	*	0.10	2.3
		Green-tailed towhee	3	0.500	*	0.31	6.9
		Brewer's sparrow	9	0.204	*	2.26	50.7
			Total			4.47	

Table B-4-14 (continued)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
4 Pinyon-juniper woodland	Mourning dove	8	*	*	0.41	4.9
	Mountain chickadee	3	0.250	*	0.61	7.3
	Mountain bluebird	4	0.333	*	0.61	7.3
	Blue-gray gnatcatcher	2	0.125	*	0.82	9.8
	Solitary vireo	3	0.500	*	0.31	3.7
	Black-throated gray warbler	3	0.250	*	0.61	7.3
	Black-headed grosbeak	1	0.250	*	0.20	2.4
	House finch	4	0.250	*	0.82	9.8
	Chipping sparrow	13	0.250	1.5	4.00	47.6
		Total			8.40	
5A Pinyon-juniper woodland			Transect was not sampled			
6 Canyon sagebrush			Transect was not sampled			
7A Upland sagebrush			Transect was not sampled			
8 Mixed mountain shrub			Transect was not sampled			

[1] Coefficient detectability

[2] Basal detectability adjustment

Table B-4-15

RESULTS OF STRIP TRANSECT CENSUSES OF BIRDS CONDUCTED DURING SEPTEMBER 1975

	Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
1	Chained pinyon-juniper rangeland	Mourning dove	1	*	*	0.05	0.5
		Common flicker	2	*	*	0.10	1.1
		Pinyon jay	1	*	*	0.05	0.5
		Black-billed magpie	1	*	*	0.05	0.5
		Clark's nutcracker	1	*	*	0.05	0.5
		Common raven	2	*	*	0.10	1.1
		Green-tailed towhee	3	0.500	1.2	0.37	3.8
		Vesper sparrow	12	0.125	1.2	5.90	61.3
		Brewer's sparrow	2	0.063	1.2	1.97	20.4
		Song sparrow	1	0.063	1.2	0.98	10.2
			Total			9.63	
2	Riparian meadow	Barn swallow	3	*	*	0.15	3.7
		Black-billed magpie	9	*	*	0.46	11.3
		Blue-gray gnatcatcher	1	0.125	*	0.41	10.0
		Red-winged blackbird	28	*	*	1.43	35.0
		Brewer's blackbird	16	*	*	0.82	20.0
		Brewer's sparrow	1	0.063	*	0.82	20.0
			Total			4.10	

Table B-4-15 (continued)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
3 Bottomland sagebrush	Common flicker	2	*	*	0.10	1.2
	Clark's nutcracker	1	*	*	0.05	0.6
	Common raven	1	*	*	0.05	0.6
	Mountain chickadee	1	1.000	*	0.05	0.6
	White-breasted nuthatch	1	0.500	*	0.10	1.2
	House wren	3	0.188	*	0.82	9.5
	Rock wren	7	0.563	*	0.64	7.4
	Blue-gray gnatcatcher	1	0.125	*	0.41	4.8
	Green-tailed towhee	2	0.500	1.2	0.25	2.9
	Vesper sparrow	4	0.094	1.2	2.62	30.5
	Brewer's sparrow	8	0.141	1.2	3.50	40.7
		Total			8.59	
4 Pinyon-juniper woodland	Mourning dove	4	*	*	0.20	1.1
	Common nighthawk	1	*	*	0.05	0.3
	Common flicker	3	*	*	0.15	0.8
	Downy woodpecker	1	*	*	0.05	0.3
	Violet-green swallow	10	*	*	0.51	2.7
	Scrub jay	1	*	*	0.05	0.3
	Black-billed magpie	1	*	*	0.05	0.3
	Clark's nutcracker	1	*	*	0.05	0.3

Table B-4-15 (continued)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
4 Pinyon-juniper woodland (Continued)	Common raven	2	*	*	0.10	0.5
	Mountain chickadee	3	0.500	*	0.31	1.6
	White-breasted nuthatch	2	0.125	*	0.82	4.4
	House wren	1	0.063	*	0.82	4.4
	Yellow-rumped warbler	5	0.250	*	1.02	5.5
	Townsend's warbler	1	0.125	*	0.41	2.2
	Black-throated gray warbler	1	0.125	*	0.41	2.2
	Chipping sparrow	25	0.113	1.2	13.66	73.1
		Total			18.68	
5A Pinyon-juniper woodland	Common flicker	1	*	*	0.05	8.3
	Clark's nutcracker	1	*	*	0.05	8.3
	Mountain chickadee	3	0.375	*	0.41	66.7
	White-breasted nuthatch	1	0.500	*	0.10	16.7
		Total			0.61	
6 Canyon sagebrush	Mourning dove	10	*	*	0.51	18.4
	Black-billed magpie	3	*	*	0.15	5.5
	Clark's nutcracker	1	*	*	0.05	1.8

Table B-4-15 (continued)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
6 Canyon sagebrush (Continued)	Common raven	2	*	*	0.10	3.7
	Green-tailed towhee	1	0.063	1.2	0.98	35.3
	Vesper sparrow	1	0.063	1.2	0.98	35.3
		Total			2.79	
7A Upland sagebrush	Common flicker	1	*	*	0.05	2.7
	Violet-green swallow	4	*	*	0.20	10.9
	Pinyon jay	15	*	*	0.77	40.9
	Clark's nutcracker	2	*	*	0.10	5.5
	Mountain chickadee	1	0.250	*	0.20	10.9
	Brewer's sparrow	1	0.141	1.5	0.54	29.0
		Total			1.88	
8 Mixed mountain shrub	Scrub jay	1	*	*	0.05	8.3
	Clark's nutcracker	1	*	*	0.05	8.3

Table B-4-15 (concluded)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
8 Mixed mountain shrub (Continued)	Mountain chickadee	1	0.250	*	0.20	33.3
	Rufous-sided towhee	2	0.500	1.5	0.31	50.0
		Total			0.61	

[1] Coefficient detectability

[2] Basal detectability adjustment

Table B-4-16

RESULTS OF STRIP TRANSECT CENSUSES OF BIRDS CONDUCTED DURING FEBRUARY 1976

	Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
1	Chained pinyon-juniper rangeland	Horned lark	2	0.125	1.2	0.33	38.6
		Common raven	3	*	*	0.05	6.0
		Townsend's solitaire	2	1.000	*	0.03	4.0
		Red crossbill	4	0.250	*	0.27	32.1
		Rufous-sided towhee	1	0.125	1.2	0.16	19.3
			Total			0.85	
2	Riparian meadow	Red-winged blackbird	1	*	*	0.02	3.6
		House finch	1	0.500	*	0.03	5.5
		Song sparrow	5	0.172	*	0.50	90.9
			Total			0.55	
3	Bottomland sagebrush	Scrub jay	1	*	*	0.03	18.8
		Evening grosbeak	1	1.000	*	0.03	18.8
		House finch	3	1.000	*	0.10	62.5
			Total			0.16	

Table B-4-16 (continued)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
4 Pinyon-juniper woodland	Common flicker	1	*	*	0.02	0.2
	Downy woodpecker	2	*	*	0.03	0.4
	Scrub jay	2	*	*	0.03	0.4
	Common raven	1	*	*	0.02	0.2
	Black-capped chickadee	4	0.500	*	0.14	1.6
	Mountain chickadee	8	0.200	*	0.68	8.1
	White-breasted nuthatch	9	0.350	*	0.44	5.2
	Red-breasted nuthatch	7	0.304	*	0.39	4.7
	Robin	1	1.000	*	0.02	0.2
	Townsend's solitaire	2	0.667	*	0.05	0.6
	Bohemian waxwing	15	0.750	*	0.34	4.0
	Evening grosbeak	25	0.694	*	0.61	7.3
	House finch	89	0.377	*	4.03	47.7
	Red crossbill	31	0.323	*	1.64	19.4
		Total			8.45	
5B Pinyon-juniper woodland	Scrub jay	1	*	*	0.02	0.1
	Pinyon jay	45	*	*	0.77	2.5
	Black-billed magpie	7	*	*	0.12	0.4
	Clark's nutcracker	2	*	*	0.03	0.1
	Mountain chickadee	13	0.531	*	0.42	1.4
	White-breasted nuthatch	8	1.000	*	0.14	0.4

Table B-4-16 (continued)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
5B Pinyon-juniper woodland (Continued)	Robin	3	0.667	*	0.08	0.3
	Townsend's solitaire	5	1.000	*	0.09	0.3
	Bohemian waxwing	193	0.115	*	28.68	94.2
	Red crossbill	6	1.000	*	0.10	0.3
		Total			30.44	
6 Canyon sagebrush	Scrub jay	2	*	*	0.20	1.7
	Black-billed magpie	1	*	*	0.10	0.9
	Townsend's solitaire	1	0.208	*	0.49	4.2
	Bohemian waxwing	75	1.000	*	7.68	66.6
	Evening grosbeak	1	1.000	*	0.10	0.9
	House finch	18	1.000	*	1.85	16.0
	Red crossbill	11	1.000	*	1.12	9.7
		Total			11.54	
7B Upland transition	Scrub jay	2	*	*	0.10	5.5
	Black-billed magpie	1	*	*	0.05	2.7
	Common raven	4	*	*	0.20	10.9
	Mountain chickadee	3	0.583	*	0.26	14.1

Table B-4-16 (concluded)

Transect		Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
7B	Upland transition (Continued)	Evening grosbeak	8	0.643	*	0.64	34.0
		House finch	8	1.000	*	0.41	21.9
		Red crossbill	4	1.000	*	0.20	10.9
			Total			1.87	
8	Mixed mountain shrub	Bohemian waxwing	10	1.000	*	1.03	66.7
		House finch	3	1.000	*	0.30	20.0
		Red crossbill	2	1.000	*	0.20	13.3
			Total			1.53	

[1] Coefficient detectability

[2] Basal detectability adjustment

Table B-4-17

RESULTS OF STRIP TRANSECT CENSUSES OF
BIRDS CONDUCTED DURING APRIL 1976

	Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
1	Chained pinyon-juniper rangeland	Common raven	1	*	*	0.02	1.8
		Robin	4	0.250	*	0.27	29.1
		Mountain bluebird	7	0.583	*	0.20	21.8
		Green-tailed towhee	2	0.500	*	0.07	7.3
		Vesper sparrow	12	0.667	*	0.31	32.7
		Dark-eyed junco	2	0.500	*	0.07	7.3
			Total			0.94	
2	Riparian meadow	Say's phoebe	2	*	*	0.03	0.6
		Robin	208	*	*	3.55	61.4
		Mountain bluebird	47	*	*	0.80	13.9
		Red-winged blackbird	61	*	*	1.04	18.0
		Brewer's blackbird	8	*	*	0.14	2.4
		Vesper sparrow	1	0.125	*	0.14	2.4
		Song sparrow	5	1.000	*	0.09	1.5
			Total			5.79	

Table B-4-17 (continued)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
3 Bottomland sagebrush	Scrub jay	1	*	*	0.03	3.3
	Common raven	1	*	*	0.03	3.3
	Mountain bluebird	14	1.000	*	0.48	52.7
	Green-tailed towhee	1	1.000	*	0.03	3.3
	Vesper sparrow	2	1.000	*	0.07	7.7
	Dark-eyed junco	3	0.376	*	0.27	29.7
		Total			0.91	
4 Pinyon-juniper woodland	Common flicker	3	*	*	0.05	1.8
	Common raven	3	*	*	0.05	1.8
	Mountain chickadee	5	1.000	*	0.09	3.0
	White-breasted nuthatch	1	1.000	*	0.02	0.6
	Evening grosbeak	5	0.500	*	0.17	6.0
	House finch	40	0.569	*	1.20	42.3
	Red crossbill	50	1.000	*	0.85	30.1
	Dark-eyed junco	3	0.125	*	0.41	14.4
		Total			2.84	

Table B-4-17 (continued)

Transect	Species	# Obs.	Coeff.^{1} Det.	Basal^2 Adj.	Density (#/ha)	% Relative Abundance
5B Pinyon-juniper woodland	Common flicker	14	*	*	0.24	7.0
	Scrub jay	4	*	*	0.07	2.0
	Pinyon jay	4	*	*	0.07	2.0
	Black-billed magpie	1	*	*	0.02	0.5
	Clark's nutcracker	2	*	*	0.03	1.0
	Common raven	2	*	*	0.03	1.0
	Black-capped chickadee	1	0.250	*	0.07	2.0
	Mountain chickadee	15	0.250	*	1.02	29.8
	Plain titmouse	5	0.500	*	0.17	5.0
	White-breasted nuthatch	13	0.203	*	1.09	31.8
	Evening grosbeak	4	1.000	*	0.07	2.0
	House finch	3	0.750	*	0.07	2.0
	Red crossbill	15	0.577	*	0.44	12.9
	Chipping sparrow	1	0.500	*	0.03	1.0
		Total			3.43	
6 Canyon sagebrush	Clark's nutcracker	1	*	*	0.10	5.2
	Mountain chickadee	1	1.000	*	0.10	5.2
	Rock wren	3	1.000	*	0.30	15.7
	Mountain bluebird	2	1.000	*	0.20	10.5
	House finch	3	1.000	*	0.30	15.7

Table B-4-17 (concluded)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
6 Canyon sagebrush (Continued)	Green-tailed towhee	1	1.000	*	0.10	5.2
	Vesper sparrow	5	1.000	*	0.51	26.7
	Dark-eyed junco	3	1.000	*	0.30	15.7
		Total			1.91	
7B Upland transition	Scrub jay	1	*	*	0.05	4.3
	Common raven	1	*	*	0.05	4.3
	Evening grosbeak	3	0.417	*	0.37	31.0
	House finch	9	1.000	*	0.46	38.8
	Red crossbill	3	1.000	*	0.15	12.9
	Vesper sparrow	1	0.500	*	0.10	8.6
		Total			1.19	
8 Mixed mountain shrub			No birds were observed			

[1] Coefficient detectability

[2] Basal detectability adjustment

Table B-4-18

RESULTS OF STRIP TRANSECT CENSUSES OF BIRDS CONDUCTED DURING JUNE 1976

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
1 Chained pinyon-juniper rangeland	Mourning dove	9	*	*	0.15	2.4
	Broad-tailed hummingbird	6	0.250	*	0.41	6.4
	Common flicker	5	*	*	0.09	1.3
	Ash-throated flycatcher	1	0.063	*	0.27	4.3
	Common raven	1	*	*	0.02	0.3
	House wren	10	0.625	*	0.27	4.3
	Mountain bluebird	12	0.583	*	0.35	5.5
	Blue-gray gnatcatcher	3	0.333	*	0.15	2.4
	House finch	2	1.000	*	0.03	0.5
	Green-tailed towhee	43	0.500	*	1.47	23.0
	Vesper sparrow	27	0.518	*	0.89	13.9
	Black-throated sparrow	2	0.500	*	0.07	1.1
	Brewer's sparrow	34	0.279	*	2.08	32.5
	Hummingbird species	1	0.125	*	0.14	2.1
		Total			6.39	
2 Riparian meadow	Broad-tailed hummingbird	2	0.125	*	0.27	4.3
	Belted kingfisher	1	*	*	0.02	0.3
	Common flicker	1	*	*	0.02	0.3
	Cassin's kingbird	1	0.063	*	0.27	4.3
	Say's phoebe	2	1.000	*	0.03	0.5

Table B-4-18 (continued)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
2 Riparian meadow (Continued)	Barn swallow	7	*	*	0.12	1.9
	Cliff swallow	30	*	*	0.51	8.1
	Violet-green swallow	13	*	*	0.22	3.5
	Tree swallow	1	*	*	0.02	0.3
	Rough-winged swallow	10	*	*	0.17	2.7
	House wren	1	1.000	*	0.02	0.3
	Robin	13	*	*	0.22	3.5
	Mountain bluebird	1	0.625	*	0.03	0.5
	Blue-gray gnatcatcher	1	1.000	*	0.02	0.3
	Western meadowlark	2	0.528	*	0.06	1.0
	Red-winged blackbird	73	0.587	*	2.12	33.6
	Brewer's blackbird	13	0.308	*	0.72	11.4
	Chipping sparrow	2	0.313	*	0.11	1.7
	Brewer's sparrow	2	1.000	*	0.03	0.5
	Song sparrow	11	0.141	*	1.34	21.1
		Total			6.31	
3 Bottomland sagebrush	Mourning dove	1	*	*	0.03	1.1
	Broad-tailed hummingbird	3	0.312	*	0.33	11.6
	Violet-green swallow	2	*	*	0.07	2.5
	Rough-winged swallow	2	*	*	0.07	2.5

Table B-4-18 (continued)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
3 Bottomland sagebrush (Continued)	Clark's nutcracker	5	*	*	0.17	6.0
	House wren	1	1.000	*	0.03	1.1
	Rock wren	5	1.000	*	0.17	6.0
	Robin	1	1.000	*	0.03	1.1
	Mountain bluebird	3	1.000	*	0.10	3.5
	Blue-gray gnatcatcher	6	1.000	*	0.20	7.0
	Virginia's warbler	2	1.000	1.5	0.10	3.5
	House finch	3	1.000	*	0.10	3.5
	Green-tailed towhee	2	0.650	*	0.11	3.9
	Vesper sparrow	1	0.500	*	0.07	2.5
	Gray-headed junco	2	1.000	*	0.07	2.5
	Brewer's sparrow	21	0.600	*	1.20	42.1
		Total			2.85	
4 Pinyon-juniper woodland	Mourning dove	2	0.583	*	0.06	1.1
	Common nighthawk	7	*	*	0.12	2.3
	White-throated swift	4	*	*	0.07	1.3
	Broad-tailed hummingbird	3	0.250	*	0.20	4.0
	Common flicker	1	*	*	0.02	0.3
	Hairy woodpecker	1	*	*	0.02	0.3
	Dusky flycatcher	1	0.125	1.5	0.20	4.0

Table B-4-18 (continued)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
4 Pinyon-juniper woodland (Continued)	Cliff swallow	5	*	*	0.09	1.7
	Violet-green swallow	7	*	*	0.12	2.3
	Steller's jay	2	*	*	0.03	0.7
	Pinyon jay	1	*	*	0.02	0.3
	Clark's nutcracker	1	*	*	0.02	0.3
	Common raven	1	*	*	0.02	0.3
	Mountain chickadee	8	0.500	*	0.27	5.3
	White-breasted nuthatch	3	0.667	*	0.08	1.5
	Robin	4	0.250	*	0.27	5.3
	Hermit thrush	6	0.500	1.5	0.31	6.0
	Mountain bluebird	15	0.500	*	0.51	10.0
	Solitary vireo	6	0.313	*	0.33	6.4
	House finch	4	0.306	*	0.22	4.4
	Vesper sparrow	1	0.500	*	0.03	0.7
	Gray-headed junco	4	0.141	*	0.49	9.5
	Chipping sparrow	9	0.094	*	1.64	31.9
		Total			5.13	
5B Pinyon-juniper woodland	Mourning dove	8	0.550	*	0.25	3.6
	Common nighthawk	2	*	*	0.03	0.5
	Broad-tailed hummingbird	3	*	*	0.05	0.7
	Common flicker	9	*	*	0.15	2.2

Table B-4-18 (continued)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
5B Pinyon-juniper woodland (Continued)	Gray flycatcher	3	0.333	1.5	0.23	3.3
	Violet-green swallow	6	*	*	0.10	1.5
	Steller's jay	1	*	*	0.02	0.2
	Scrub jay	6	*	*	0.10	1.5
	Pinyon jay	61	*	*	1.04	15.0
	Black-billed magpie	1	*	*	0.02	0.2
	Clark's nutcracker	4	*	*	0.07	1.0
	Mountain chickadee	11	0.550	*	0.34	4.9
	Plain titmouse	5	0.375	*	0.23	3.3
	White-breasted nuthatch	4	1.000	*	0.07	1.0
	House wren	13	0.571	*	0.39	5.6
	Robin	2	0.500	*	0.07	1.0
	Hermit thrush	5	0.625	1.5	0.20	2.9
	Mountain bluebird	11	0.528	*	0.36	5.1
	Blue-gray gnatcatcher	2	0.196	*	0.17	2.5
	Solitary vireo	5	0.500	*	0.17	2.5
	Black-throated gray warbler	21	0.500	*	0.72	10.3
	House finch	16	0.533	*	0.51	7.4
	Rufous-sided towhee	4	0.571	*	0.12	1.7
	Gray-headed junco	13	0.325	*	0.68	9.8
	Chipping sparrow	12	0.236	*	0.87	12.5
		Total			6.97	

Table B-4-18 (continued)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
6 Canyon sagebrush	Mourning dove	1	*	*	0.10	2.2
	Broad-tailed hummingbird	1	0.500	*	0.20	4.3
	Common flicker	1	*	*	0.10	2.2
	Gray flycatcher	1	1.000	1.5	0.15	3.3
	Cliff swallow	2	*	*	0.20	4.3
	Rock wren	1	1.000	*	0.10	2.2
	Robin	2	1.000	*	0.20	4.3
	Hermit thrush	1	1.000	1.5	0.15	3.3
	Mountain bluebird	6	1.000	*	0.61	13.3
	Solitary vireo	1	1.000	*	0.10	2.2
	Virginia's warbler	1	1.000	1.5	0.15	3.3
	House finch	6	1.000	*	0.61	13.3
	Green-tailed towhee	6	1.000	*	0.61	13.3
	Rufous-sided towhee	1	0.500	*	0.20	4.3
	Gray-headed junco	4	0.500	*	0.82	17.8
	Chipping sparrow	1	1.000	*	0.10	2.2
	Brewer's sparrow	2	1.000	*	0.20	4.3
		Total			4.60	

Table B-4-18 (continued)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
7B Upland transition	Mourning dove	4	*	*	0.20	5.0
	Broad-tailed hummingbird	1	0.250	*	0.20	5.0
	Common flicker	1	*	*	0.05	1.2
	Mountain chickadee	3	0.600	*	0.26	6.2
	Mountain bluebird	7	0.583	*	0.61	14.9
	Solitary vireo	1	0.500	*	0.10	2.5
	House finch	3	0.583	*	0.26	6.4
	Green-tailed towhee	3	0.500	*	0.31	7.5
	Vesper sparrow	8	0.528	*	0.78	18.9
	Chipping sparrow	8	0.500	*	0.82	19.9
	Brewer's sparrow	6	0.600	*	0.51	12.5
		Total			4.11	
8 Mixed mountain shrub	Common nighthawk	1	*	*	0.10	2.1
	Say's phoebe	1	1.000	*	0.10	2.1
	Gray flycatcher	1	1.000	1.5	0.15	3.2
	Violet-green swallow	1	*	*	0.10	2.1
	Mountain chickadee	2	1.000	*	0.20	4.2
	Robin	3	1.000	*	0.30	6.4
	Blue-gray gnatcatcher	6	0.533	*	1.15	24.4
	Virginia's warbler	4	1.000	1.5	0.61	13.0

Table B-4-18 (concluded)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
8 Mixed mountain shrub (Continued)	Black-throated gray warbler	1	1.000	*	0.10	2.1
	Green-tailed towhee	7	0.658	*	1.09	23.1
	Chipping sparrow	1	1.000	*	0.10	2.1
	Brewer's sparrow	3	1.000	*	0.31	6.6
	Hummingbird species	1	0.250	*	0.40	8.5
		Total			4.71	

[1] Coefficient detectability

[2] Basal detectability adjustment

Table B-4-19

RESULTS OF STRIP TRANSECT CENSUSES OF BIRDS CONDUCTED DURING JULY 1976

	Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
1	Chained pinyon-juniper rangeland	Common flicker	7	*	*	0.36	16.8
		House wren	1	0.094	*	0.55	25.6
		Mountain bluebird	1	0.500	*	0.10	4.8
		Blue-gray gnatcatcher	3	0.500	*	0.31	14.4
		Vesper sparrow	4	0.250	*	0.82	38.4
			Total			2.13	
2	Riparian meadow	Common flicker	1	*	*	0.05	0.9
		Say's phoebe	3	0.250	*	0.62	11.3
		Barn swallow	2	0.250	*	0.41	7.6
		Cliff swallow	30	*	*	1.54	28.4
		Rough-winged swallow	1	*	*	0.05	0.9
		Robin	1	*	*	0.05	0.9
		Mountain bluebird	2	1.000	*	0.10	1.9
		Red-winged blackbird	24	0.619	*	1.99	36.7
		House finch	2	0.500	*	0.21	3.8
		Vesper sparrow	1	0.500	*	0.10	1.9
		Song sparrow	3	0.500	*	0.30	5.7
			Total			5.42	

Table B-4-19 (continued)

	Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
3	Bottomland sagebrush	House wren	2	0.500	*	0.41	13.6
		Rock wren	6	1.000	*	0.61	20.2
		Brewer's sparrow	5	0.385	1.5	1.99	66.2
			Total			3.01	
4	Pinyon-juniper woodland	Mourning dove	2	0.219	*	0.47	25.3
		Common flicker	1	*	*	0.05	2.8
		Mountain chickadee	3	0.250	*	0.61	33.2
		White-breasted nuthatch	2	0.250	*	0.41	22.1
		Chipping sparrow	1	0.250	1.5	0.31	16.6
			Total			1.85	
5B	Pinyon-juniper woodland			Transect was not sampled			
6	Canyon sagebrush			Transect was not sampled			

Table B-4-19 (concluded)

Transect	Species	# Obs.	Coeff.[1] Det.	Basal[2] Adj.	Density (#/ha)	% Relative Abundance
7B Upland transition			Transect was not sampled			
8 Mixed mountain shrub			Transect was not sampled			

[1] Coefficient detectability

[2] Basal detectability adjustment

Table B-4-20

AVIFAUNA DENSITY ESTIMATES (#/ha) AND CONFIDENCE INTERVALS (C.I.) FOR STRIP TRANSECTS SAMPLED IN TRIPLICATE DURING FEBRUARY 1976

Transect	Species	# Obs.	Density	80% C.I.
1 Chained pinyon-juniper rangeland	Horned lark	2	0.33	-0.290 — 0.946
	Common raven	3	0.05	-0.005 — 0.107
	Townsend's solitaire	2	0.03	0.002 — 0.066
	Red crossbill	4	0.27	-0.242 — 0.789
	Rufous-sided towhee	1	0.16	-0.145 — 0.473
2 Riparian meadow	Red-winged blackbird	1	0.02	-0.015 — 0.049
	House finch	1	0.03	-0.030 — 0.099
	Song sparrow	5	0.50	0.001 — 0.992
3 Bottomland sagebrush	Scrub jay	1	0.03	-0.030 — 0.099
	Evening grosbeak	1	0.03	-0.030 — 0.099
	House finch	3	0.10	-0.009 — 0.214
4 Pinyon-juniper woodland	Common flicker	1	0.02	-0.015 — 0.049
	Downy woodpecker	2	0.03	-0.030 — 0.099
	Scrub jay	2	0.03	-0.030 — 0.099
	Common raven	1	0.02	-0.015 — 0.049
	Black-capped chickadee	4	0.14	0.008 — 0.265
	Mountain chickadee	8	0.68	0.102 — 1.264
	White-breasted nuthatch	9	0.44	0.017 — 0.861
	Red-breasted nuthatch	7	0.39	-0.197 — 0.984

Table B-4-20 (Concluded)

Transect	Species	# Obs.	Density	80% C.I.
4 (Continued)	Robin	1	0.02	-0.015 — 0.049
	Townsend's solitaire	2	0.05	-0.045 — 0.148
	Bohemian waxwing	15	0.34	-0.030 — 0.713
	Evening grosbeak	25	0.61	-0.114 — 1.344
	House finch	89	4.03	3.414 — 4.646
	Red crossbill	31	1.64	0.860 — 2.418
5B Pinyon-juniper woodland	Scrub jay	1	0.02	-0.015 — 0.049
	Pinyon jay	45	0.77	0.039 — 1.498
	Black-billed magpie	7	0.12	0.087 — 0.152
	Clark's nutcracker	2	0.03	-0.030 — 0.099
	Mountain chickadee	13	0.42	0.097 — 0.739
	White-breasted nuthatch	8	0.14	0.051 — 0.222
	Robin	3	0.08	-0.007 — 0.161
	Townsend's solitaire	5	0.09	0.053 — 0.118
	Bohemian waxwing	193	28.68	2.443 —54.924
	Red crossbill	6	0.10	0.047 — 0.158

Table B-4-21

AVIFAUNA DENSITY ESTIMATES (#/ha) AND CONFIDENCE INTERVALS (C.I.) FOR STRIP TRANSECTS SAMPLED IN TRIPLICATE DURING APRIL 1976

Transect	Species	# Obs.	Density	80% C.I.
1 Chained pinyon-juniper rangeland	Common raven	1	0.02	-0.015 — 0.049
	Robin	4	0.27	-0.242 — 0.789
	Mountain bluebird	7	0.20	0.150 — 0.260
	Green-tailed towhee	2	0.07	0.004 — 0.133
	Vesper sparrow	12	0.31	0.224 — 0.391
	Dark-eyed junco	2	0.07	-0.061 — 0.197
2 Riparian meadow	Say's phoebe	2	0.03	-0.030 — 0.099
	Robin	208	3.55	2.430 — 4.674
	Mountain bluebird	47	0.80	0.110 — 1.496
	Red-winged blackbird	61	1.04	0.135 — 1.949
	Brewer's blackbird	8	0.14	-0.121 — 0.394
	Vesper sparrow	1	0.14	-0.121 — 0.394
	Song sparrow	5	0.09	0.053 — 0.118
3 Bottomland sagebrush	Scrub jay	1	0.03	-0.030 — 0.099
	Common raven	1	0.03	-0.030 — 0.099
	Mountain bluebird	14	0.48	0.246 — 0.710
	Green-tailed towhee	1	0.03	-0.030 — 0.099
	Vesper sparrow	2	0.07	-0.061 — 0.197
	Dark-eyed junco	3	0.27	-0.024 — 0.571

Table B-4-21 (concluded)

Transect	Species	# Obs.	Density	80% C.I.
4 Pinyon-juniper woodland	Common flicker	3	0.05	-0.005 — 0.107
	Common raven	3	0.05	-0.045 — 0.148
	Mountain chickadee	5	0.09	0.000 — 0.171
	White-breasted nuthatch	1	0.02	-0.015 — 0.049
	Evening grosbeak	5	0.17	-0.061 — 0.403
	House finch	40	1.20	0.804 — 1.596
	Red crossbill	50	0.85	0.152 — 1.556
	Dark-eyed junco	3	0.41	-0.363 — 1.183
5B Pinyon-juniper woodland	Common flicker	14	0.24	0.154 — 0.324
	Scrub jay	4	0.07	0.036 — 0.101
	Pinyon jay	4	0.07	0.004 — 0.133
	Black-billed magpie	1	0.02	-0.015 — 0.049
	Clark's nutcracker	2	0.03	0.002 — 0.066
	Common raven	2	0.03	0.002 — 0.066
	Black-capped chickadee	1	0.07	-0.061 — 0.197
	Mountain chickadee	15	1.02	0.578 — 1.471
	Plain titmouse	5	0.17	-0.151 — 0.493
	White-breasted nuthatch	13	1.09	-0.017 — 2.203
	Evening grosbeak	4	0.07	0.004 — 0.133
	House finch	3	0.07	-0.006 — 0.143
	Red crossbill	15	0.44	0.154 — 0.734
	Chipping sparrow	1	0.03	-0.030 — 0.099

Table B-4-22

AVIFAUNA DENSITY ESTIMATES (#/ha) AND CONFIDENCE INTERVALS (C.I.) FOR STRIP TRANSECTS SAMPLED IN TRIPLICATE DURING JUNE 1976

Transect	Species	# Obs.	Density	80% C.I.
1 Chained pinyon-juniper rangeland	Mourning dove	9	0.15	0.057 — 0.250
	Broad-tailed hummingbird	6	0.41	0.410 — 0.410
	Common flicker	5	0.09	0.053 — 0.118
	Ash-throated flycatcher	1	0.27	-0.242 — 0.789
	Common raven	1	0.02	-0.015 — 0.049
	House wren	10	0.27	0.049 — 0.498
	Mountain bluebird	12	0.35	0.160 — 0.543
	Blue-gray gnatcatcher	3	0.15	-0.014 — 0.321
	House finch	2	0.03	0.002 — 0.066
	Green-tailed towhee	43	1.47	1.340 1.597
	Vesper sparrow	27	0.89	0.605 — 1.175
	Black-throated sparrow	2	0.07	-0.061 — 0.197
	Brewer's sparrow	34	2.08	1.963 — 2.193
	Hummingbird species	1	0.14	-0.121 — 0.394
2 Riparian meadow	Broad-tailed hummingbird	2	0.27	-0.242 — 0.789
	Belted kingfisher	1	0.02	-0.015 — 0.049
	Common flicker	1	0.02	-0.015 — 0.049
	Cassin's kingbird	1	0.27	-0.242 — 0.789
	Say's phoebe	2	0.03	-0.030 — 0.099
	Barn swallow	7	0.12	-0.060 — 0.299
	Cliff swallow	30	0.51	-0.067 — 1.092
	Violet-green swallow	13	0.22	0.052 — 0.392

Table B-4-22 (continued)

Transect	Species	# Obs.	Density	80% C.I.
2 (Continued)	Tree swallow	1	0.02	-0.015 — 0.049
	Rough-winged swallow	10	0.17	0.086 — 0.256
	House wren	1	0.02	-0.015 — 0.049
	Robin	13	0.22	0.093 — 0.351
	Mountain bluebird	1	0.03	-0.024 — 0.079
	Blue-gray gnatcatcher	1	0.02	-0.015 — 0.049
	Western meadowlark	2	0.06	-0.057 — 0.187
	Red-winged blackbird	73	2.12	1.542 — 2.703
	Brewer's blackbird	13	0.72	-0.011 — 1.451
	Chipping sparrow	2	0.11	-0.097 — 0.315
	Brewer's sparrow	2	0.03	0.002 — 0.066
	Song sparrow	11	1.34	0.730 — 1.942
3 Bottomland sagebrush	Mourning dove	1	0.03	-0.030 — 0.099
	Broad-tailed hummingbird	3	0.33	-0.029 — 0.685
	Violet-green swallow	2	0.07	0.004 — 0.133
	Rough-winged swallow	2	0.07	-0.061 — 0.197
	Clark's nutcracker	5	0.17	0.000 — 0.341
	House wren	1	0.03	-0.030 — 0.099
	Rock wren	5	0.17	0.000 — 0.341
	Robin	1	0.03	-0.030 — 0.099
	Mountain bluebird	3	0.10	-0.009 — 0.214
	Blue-gray gnatcatcher	6	0.20	0.093 — 0.316

Table B-4-22 (continued)

Transect	Species	# Obs.	Density	80% C.I.
3 (Continued)	Virginia's warbler	2	0.10	-0.091 — 0.296
	House finch	3	0.10	-0.009 — 0.214
	Green-tailed towhee	2	0.11	0.006 — 0.204
	Vesper sparrow	1	0.07	-0.061 — 0.197
	Gray-headed junco	2	0.07	-0.061 — 0.197
	Brewer's sparrow	21	1.20	0.703 — 1.687
4 Pinyon-juniper woodland	Mourning dove	2	0.06	0.003 — 0.114
	Common nighthawk	7	0.12	0.034 — 0.205
	White-throated swift	4	0.07	-0.061 — 0.197
	Broad-tailed hummingbird	3	0.20	-0.018 — 0.428
	Common flicker	1	0.02	-0.015 — 0.049
	Hairy woodpecker	1	0.02	-0.015 — 0.049
	Dusky flycatcher	1	0.20	-0.182 — 0.591
	Cliff swallow	5	0.09	-0.076 — 0.246
	Violet-green swallow	7	0.12	-0.106 — 0.345
	Steller's jay	2	0.03	-0.030 — 0.099
	Pinyon jay	1	0.02	-0.015 — 0.049
	Clark's nutcracker	1	0.02	-0.015 — 0.049
	Common raven	1	0.02	-0.015 — 0.049
	Mountain chickadee	8	0.27	-0.068 — 0.614
	White-breasted nuthatch	3	0.08	-0.007 — 0.161
	Robin	4	0.27	-0.068 — 0.614

Table B-4-22 (continued)

Transect	Species	# Obs.	Density	80% C.I.
4 (Continued)	Hermit thrush	6	0.31	0.018 — 0.597
	Mountain bluebird	15	0.51	0.512 — 0.512
	Solitary vireo	6	0.33	0.328 — 0.328
	House finch	4	0.22	-0.055 — 0.502
	Vesper sparrow	1	0.03	-0.030 — 0.099
	Gray-headed junco	4	0.49	-0.120 — 1.092
	Chipping sparrow	9	1.64	1.044 — 2.233
5B Pinyon-juniper woodland	Mourning dove	8	0.25	0.037 — 0.460
	Common nighthawk	2	0.03	0.002 — 0.066
	Broad-tailed hummingbird	3	0.05	0.051 — 0.051
	Common flicker	9	0.15	0.057 — 0.250
	Gray flycatcher	3	0.23	-0.020 — 0.482
	Violet-green swallow	6	0.10	-0.009 — 0.214
	Steller's jay	1	0.02	-0.015 — 0.049
	Scrub jay	6	0.10	0.006 — 0.199
	Pinyon jay	61	1.04	-0.778 — 2.862
	Black-billed magpie	1	0.02	-0.015 — 0.049
	Clark's nutcracker	4	0.07	-0.061 — 0.197
	Mountain chickadee	11	0.34	0.224 — 0.459
	Plain titmouse	5	0.23	-0.202 — 0.657
	White-breasted nuthatch	4	0.07	-0.017 — 0.154
	House wren	13	0.39	0.239 — 0.538

Table B-4-22 (concluded)

Transect	Species	# Obs.	Density	80% C.I.
5B (Continued)	Robin	2	0.07	0.004 — 0.133
	Hermit thrush	5	0.20	-0.182 — 0.591
	Mountain bluebird	11	0.36	0.295 — 0.417
	Blue-gray gnatcatcher	2	0.17	-0.154 — 0.502
	Solitary vireo	5	0.17	0.106 — 0.235
	Black-throated gray warbler	21	0.72	0.606 — 0.829
	House finch	16	0.51	0.077 — 0.948
	Rufous-sided towhee	4	0.12	-0.030 — 0.269
	Gray-headed junco	13	0.68	0.159 — 1.207
	Chipping sparrow	12	0.87	0.395 — 1.340

Table B-4-23 ARTHROPODS COLLECTED ON GRIDS 1 (CHAINED PINYON-JUNIPER RANGELAND) AND 2 (PINYON-JUNIPER WOODLAND), TRACT C-b, SEPTEMBER 1974 - AUGUST 1976

SCIENTIFIC NAME	COMMON NAME	Pit Cans		*Amelanchier* ssp.		*Cercocarpus montanus*		*Artemisia tridentata*		Feeding Type[1]
		Grid 1	Grid 2	Grid 1	Grid 2	Grid 1	Grid 2	Grid 1	Grid 2	
DIPLOPODA	Millipedes	x								S
CHELIPODA										
Geophilomorpha	Centipedes		x							P
INSECTA										
THYSANURA										
Machilidae	Jumping bristletails	x	x							H
COLLEMBOLA										
Entomobryidae	Springtails	x	x							S
Smithuridae	Springtails		x				x			S
ORTHOPTERA										
Acrididae	Short-horned grasshoppers	x					x			H
Tettigoniidae	Long-horned grasshoppers	x			x					H
Gryllacrididae	Jerusalem crickets	x	x							P
Gryllidae	Crickets	x	x							H
PSOCOPTERA	Psocids	x			x				x	H
THYSANOPTERA										
Phloeothripidae	Thrips		x	x	x	x	x	x	x	H
HEMIPTERA										
Anthocoridae	Minute pirate bugs	x			x	x	x	x	x	P
Miridae	Plant bugs	x		x	x	x	x	x	x	H
Nabidae	Damsel bugs	x		x	x		x	x	x	H
Reduviidae	Assassin bugs	x			x	x		x	x	P
Tingitidae	Lace bugs			x		x	x	x	x	H
Lygaeidae	Seed bugs	x				x	x	x	x	H
Coreidae	Leaf-footed bugs	x						x		H
Pentatomidae	Shield-backed bugs	x					x	x		H
HOMOPTERA										
Cicadellidae	Leafhoppers	x	x	x	x	x	x	x	x	H
Fulgoridae	Fulgorid leafhoppers		x					x	x	H
Psyllidae	Psyllids			x	x	x	x	x		H
Aphididae	Aphids			x	x	x	x	x	x	H
Eriosomatidae	Gall-making aphids			x		x			x	H
Chermidae	Jumping plant lice			x		x	x	x		H
Coccoidea	Scale insects			x	x	x		x		H
COLEOPTERA										
Cicindelidae	Tiger beetles	x								P
Carabidae	Ground beetles	x	x							P
Histeridae	Hister beetles		x	x						P
Silphidae	Carrion bettles	x	x							S
Staphylinidae	Rove beetles	x								P
Lampyridae	Lightningbugs		x							P
Dermestidae	Dermestid beetles	x								S
Malachiidae	Soft-winged flower beetles	x	x	x	x	x		x	x	P
Cleridae	Checkered beetles			x	x	x	x	x	x	P
Elateridae	Click beetles	x	x							H
Throscidae	Throscid beetles		x							
Buprestidae	Metallic wood-boring beetles				x				x	H
Coccinellidae	Ladybird beetles	x		x	x	x	x	x	x	P
Anthicidae	Antlike flower beetles			x						H
Pedilidae	Pedilid beetles					x				H
Tenebrionidae	Darkling beetles	x	x							S
Bostrichidae	Branch borers						x			H
Scarabaeidae	Scarab beetles	x	x							S
Chrysomelidae	Leaf beetles	x				x		x	x	H
Anthribidae	Fungus weevils					x				H
Curculionidae	Snout beetles		x		x	x	x	x	x	H
Scolytidae	Bark beetles	x		x						H

Table B-4-23 (continued)

		Pit Cans		*Amelanchier* ssp.		*Cercocarpus montanus*		*Artemisia tridentata*		
SCIENTIFIC NAME	COMMON NAME	Grid 1	Grid 2	Grid 1	Grid 2	Grid 1	Grid 2	Grid 1	Grid 2	Feeding[1] Type
NEUROPTERA										
Raphididae	Raphidid snakeflies						x			P
Coniopterygidae	Dusty-wings		x		x				x	P
Chrysopidae	Common lacewings			x	x	x	x	x	x	P
LEPIDOPTERA										
Geometridae	Measuringworms		x	x	x	x	x	x	x	H
Microlepidoptera	Microlepidopteran adults		x	x	x	x	x	x	x	H
Lepidopteran larvae	Caterpillars	x	x	x	x	x	x	x	x	H
DIPTERA										
Chrionomidae	Midges					x				
Sciaridae	Dark-winged fungus gnats					x				H
Cecidomyiidae	Gall midges		x	x	x		x	x		H
Asilidae	Robber flies	x		x						P
Bombyliidae	Bee flies					x				H
Empididae	Dance flies				x			x		P
Dolichopodidae	Long-legged flies		x	x		x		x		P
Phoridae	Humpbacked flies	x		x	x			x	x	H
Syrphidae	Syrphid flies			x				x		P
Tephritidae	Fruit flies			x				x	x	H
Milichiidae	Milichiid flies					x				H
Chloropidae	Chloropid flies		x				x			H
Calliphoridae	Blow flies		x							S
Dipteran larvae	Fly larvae						x			-
Dipteran pupae	Fly pupae					x				-
SIPHONAPTERA	Fleas	x								PA
HYMENOPTERA										
Cephidae	Stem sawflies							x		H
Braconidae	Braconid wasps			x	x		x	x	x	PA
Ichneumonidae	Ichneumonid wasps	x	x	x	x	x		x	x	PA
Chalcidoidea	Chalcid wasps			x	x	x	x	x	x	PA
Cynipidae	Gall wasps			x			x	x		H
Platygasteridae	Platygasterid wasps							x		PA
Bethylidae c.f.	Bethylid wasps				x					PA
Mutillidae	Velvet ants	x	x							PA
Formicidae	Ants	x	x	x	x	x	x	x	x	O
Pompilidae	Spider wasps	x	x							P
Sphecidae	Sphecid wasps		x							P
ARACHNIDA										
PHALANGIDA										
Phalangiidae	Daddy-longlegs	x	x							H
ACARINA	Mites	x	x	x	x	x	x	x	x	-
IXOIDES	Ticks						x			PA
ARANEIDA										
Dictynidae	Dictynid spiders	x	x	x				x	x	P
Plectreuridae c.f.	Plectreurid spiders	x	x							P
Pholcidae	Long-legged spiders	x	x							P
Theridiidae	Comb-footed spiders						x			P
Micryphantidae	Dwarf spiders	x		x	x	x	x	x	x	P
Araneidae	Orb-weavers	x	x		x					P
Agelenidae	Funnel web weavers	x								P
Hahniidae	Hahnid spiders	x								P
Lycosidae	Wolf spiders	x	x	x			x	x		P
Oxyopidae	Lynx spiders	x	x	x	x		x	x	x	P
Gnaphosidae	Hunting spiders	x	x							P
Clubionidae	Two-clawed hunting spiders	x		x	x	x	x	x	x	P
Thomisidae	Crab spiders	x	x	x	x	x	x	x	x	P
Salticidae	Jumping spiders		x	x	x	x	x	x	x	P

Table B-4-24 ARTHROPODS COLLECTED FROM PIT CANS ON TRACT C-b, SEPTEMBER 1974 - AUGUST 1976

Scientific Name	Common Name	Chained Pinyon-Juniper (Grid 1)											Pinyon-Juniper Woodland (Grid 2)										
		9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ	9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ
DIPLOPODA	Millipedes	1										1											
CHILOPODA																							
Geophilomorpha	Centipedes													1									1
INSECTA																							
Thysanura																							
Machilidae	Jumping bristletails	4										4	4		1	4		5				2	16
Collembola																							
Entomobryidae	Springtails	1										1						3					3
Smithuridae	Springtails												1										1
Orthoptera																							
Acrididae	Short-horned grasshoppers	1		1								2											
Tettigoniidae	Long-horned grasshoppers	1										1											
Gryllacrididae	Jerusalem crickets	3			8	7	7		3		5	33	1	2	2	1		8		7	3	2	26
Gryllidae	Crickets	1										1				1							1
Psocoptera	Psocids	1										1											
Thysanoptera																							
Phloeothripidae	Thrips																					1	1

Table B-4-24 (Continued)

		Chained Pinyon-Juniper (Grid 1)											Pinyon-Juniper Woodland (Grid 2)										
Scientific Name	Common Name	9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ	9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ
Coleoptera																							
Cicindelidae	Tiger beetles					1						1											
Carabidae	Ground beetles	2	7	3	7	1	3	5			2	30		4	3	3		2	4	1	1	2	20
Histeridae	Hister beetles														1								1
Silphidae	Carrion beetles				1		2		4			7			1	1							2
Staphylinidae	Rove beetles									1		1											
Lampyridae	Lightningbugs																	1					1
Dermestidae	Dermestid beetles						3					3											
Malachiidae	Soft-winged flower beetles									1		1									1		1
Elateridae	Click beetles			2								2				1							1
Throscidae	Throscid beetles														1								1
Coccinellidae	Ladybird beetles						1					1											
Tenebrionidae	Darkling beetles		3	10	13	4	2	3	14	1		50		5	15	5	2	3	3	29	4	4	70
Scarabaeidae	Scarab beetles		1				1	1	1			4		4	1			1					6
Chrysomelidae	Leaf beetles	1	1									2											
Curculionidae	Snout beetles																					1	1
Scolytidae	Bark beetles			1								1											
Neuroptera																							
Coniopterygidae	Dusty-wings																	1					1

Table B-4-24 (Continued)

Scientific Name	Common Name	Chained Pinyon-Juniper (Grid 1) 9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/75	Σ	Pinyon-Juniper Woodland (Grid 2) 9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ
Hemiptera																							
Anthocoridae	Minute pirate bugs										1	1											
Miridae	Plant bugs		1				1		1		1	4											
Nabidae	Damsel bugs	2										2											
Reduviidae	Assassin bugs	3		1								4											
Lygaeidae	Seed bugs		1			1						2											
Coreidae	Leaf-footed bugs					1	3					4											
Pentatomidae	Shield-backed bugs				1							1											
Homoptera																							
Cicadellidae	Leafhoppers	1					2					3						1	2	2			5
Fulgoridae	Fulgorid leafhoppers																		2				2

Table B-4-24 (Continued)

Scientific Name	Common Name	Chained Pinyon-Juniper (Grid 1)											Pinyon-Juniper Woodland (Grid 2)										
		9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ	9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ
Lepidoptera																							
Geometridae	Measuringworms																	1			1		2
Microlepidoptera	Microlepidopteran adults																	1					1
Lepidopteran larvae	Caterpillars			5				4				9						1					1
Diptera																							
Cecidomyidae	Gall midges												1										1
Asilidae	Robber flies						1					1											
Dolichopodidae	Long-legged flies												1										1
Phoridae	Humpbacked flies	1						1				2											
Chloropidae	Chloropid flies																	1					1
Calliphoridae	Blow flies																	1					1
Siphonaptera	Fleas		2		1							3											
Hymenoptera																							
Ichneumonidae	Ichneumonid wasps			1								1							1				1
Mutillidae	Velvet ants					1						1								1			1
Formicidae	Ants	10	6	4	3		9	22	24	2	6	86	5	4	95	10	5	15	104	14	3	64	319
Pompilidae	Spider wasps	1					1					2					1	1					2
Sphecidae	Sphecid wasps														1			1					2

Table B-4-24 (Concluded)

Scientific Name	Common Name	Chained Pinyon-Juniper (Grid 1) 9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ	Pinyon-Juniper Woodland (Grid 2) 9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ
ARACHNIDA																							
Phalangida																							
Phalangiidae	Daddy-longlegs	2	1	1					1			5	3	1	1					1	1		7
Acari	Mites	1					2	8				11	105			2		95		5		5	212
Araneida																							
Dictynidae	Dictynid spiders	1				1						2		1									1
Plectreuridae	Plectreurid spiders								1			1								1			1
Pholcidae	Long-legged spiders			1	2	1						4	1									1	2
Micryphantidae	Dwarf spiders	1									1	2											
Araneidae	Orb weavers	2										2	6										6
Agelenidae	Funnel web weavers	3						1				4	1										1
Hahnidae	Hahnid spiders	3										3											
Lycosidae	Wolf spiders	11	2	5	14	3	7	1	3	2	2	50	1	8	6		7	5	1	4	2	1	35
Oxyopidae	Lynx spiders					1						1								2			2
Gnaphosidae	Hunting spiders	10	6	9	5	1	3	4	2	1	1	42	5	18	15	2		2	8	5	2		57
Clubionidae	Two-clawed hunting spiders						1					1											
Thomisidae	Crab spiders	13			1		3					17		1									1
Salticidae	Jumping spiders														1				1	1			3
Number of Individuals		81	31	44	56	23	52	50	54	8	19	418	135	49	144	30	15	149	126	73	18	83	822
Number of Families		26	11	13	11	12	18	10	10	6	8	50	13	11	14	10	4	20	9	13	9	10	44
Number of Trap Nights		2	2	2	1	1	2	2	1	1	2		2	2	2	1	1	2	2	1	1	2	

Table B-4-25 SPECIES DIVERSITY FOR ARTHROPODS COLLECTED BY PIT CANS AND SWEEP NETS ON TRACT C-b, SEPTEMBER 1974 - AUGUST 1976

Grid/ Trapping Period	Pit Cans	*Amelanchier* spp.	*Cercocarpus montanus*	*Artemisia tridentata*
Chained Pinyon-Juniper Grid 1				
9/74	4.0236	2.5306	0.8501	2.5595
5/75	3.0372	2.3978	1.5332	2.7774
6/75	3.1930	2.7784	1.2115	2.5219
7/75	2.8891	2.8119	2.5016	1.7394
8/75	3.1146	1.9487	2.7052	2.8904
9/75	3.7850	2.7405	3.1852	2.3827
5/76	2.5544	2.7616	2.6317	3.1658
6/76	2.3687	2.6859	2.1211	2.9870
7/76	2.5000	3.1556	2.7956	1.9537
8/76	2.6101	3.6304	2.7891	2.6775
	$\bar{x}$ 3.0075	2.7441	2.2324	2.5655
Pinyon-Juniper Woodland Grid 2				
9/74	1.4732	--	--	--
5/75	2.8256	3.2687	2.4213	1.9310
6/75	1.8671	2.4067	1.0000	1.7527
7/75	2.8541	3.2267	1.6241	3.4861
8/75	1.6895	1.8313	1.7401	2.8730
9/75	2.2294	1.4603	2.8904	2.7764
5/76	1.1233	3.5926	2.7999	3.0296
6/76	2.7781	2.8855	3.1499	3.1541
7/76	2.9750	3.2037	2.5165	3.3643
8/76	1.4400	3.6212	2.5679	3.4662
	$\bar{x}$ 2.1255	2.8329	2.3011	2.8703

Table B-4-26 SIGNIFICANCE TESTS[1] OF ARTHROPOD SPECIES DIVERSITY INDICES ON GRIDS 1 (CHAINED PINYON-JUNIPER) AND 2 (PINYON-JUNIPER WOODLAND)

Null Hypothesis	Statistic	Critical[2] Value	Decision on Null
H_0: Sweep net arthropod species diversity is the same on all three plant species on Grid 1.	H = 1.790	X^2 = 7.815	Accept
H_0: Sweep net arthropod species diversity is the same on all three plant species on Grid 2.	H = 7.448	X^2 = 5.991	Reject
H_0: Pit can arthropod species diversity is the same on Grid 2 as on Grid 1.	U´ = 83	U = 77	Reject
H_0: Species diversity on *Amelanchier* spp. is the same on Grid 1 as on Grid 2.	U´ = 55	U = 70	Accept
H_0: Species diversity on *Cercocarpus montanus* is the same on Grid 1 as on Grid 2.	U´ = 48	U = 70	Accept
H_0: Species diversity on *Artemisia tridentata* is the same on Grid 1 as on Grid 2	U´ = 63	U = 70	Accept

[1] Man-Whitney U Test, Kruskal-Wallis Test

[2] Level of Significance = .05

Table B-4-27 ARTHROPODS COLLECTED FROM AMELANCHIER SPP. ON TRACT C-b, SEPTEMBER 1974 - AUGUST 1976

Scientific Name	Common Name	Chained Pinyon-Juniper (Grid 1)											Pinyon-Juniper Woodland (Grid 2)										
		9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ	9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ
INSECTA																							
Orthoptera																							
Tettigoniidae	Long-horned grasshopper														1								1
Psocoptera	Psocids																		1				1
Thysanoptera																							
Phloeothripidae	Thrips	1			1	2	5	2	1	2	3	17		8		1	1	5				1	16
Hemiptera																							
Anthocoridae	Minute pirate bugs															1							1
Miridae	Plant bugs	1		1	1	1	6	2	5		3	20		4		7	2	9	10	3	2	7	44
Nabidae	Damsel bugs						1					1						1				1	2
Reduviidae	Assassin bugs																	4				3	7
Tingitidae	Lace bugs					57		51			1	109											
Homoptera																							
Cicadellidae	Leafhoppers	1	1		7	1	4	4	2	4	6	30		1		5	3	1	6	5	3	6	30
Psyllidae	Psyllids		2	1	6	2	1	2	1	3	1	19		1		2	3	2	1	1	1	1	12
Aphididae	Aphids	6		1	20	20	41	8	1		1	98					31	156	1		1	3	192
Eriosomatidae	Gall-making aphids			5								5											
Chermidae	Jumping plant lice														4								4
Coccoidea	**Scale insects**			1								1					1						1

Table B-4-27 (Continued)

Scientific Name	Common Name	Chained Pinyon-Juniper (Grid 1)											Pinyon-Juniper Woodland (Grid 2)										
		9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ	9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ
Coleoptera																							
Histeridae	Hister beetles										1	1											
Malachiidae	Soft-winged flower beetles				1			1				2								1			1
Cleridae	Checkered beetles		1	1				3				5		2				1	17				20
Buprestidae	Metallic wood-boring beetles																	1					1
Coccinellidae	Ladybird beetles					1	10	1			2	14						4	1			2	7
Anthicidae	Ant-like flower beetles						1					1											
Curculionidae	Snout beetles															1		1	2		2	1	7
Scolytidae	Bark beetles							1	1			2											
Neuroptera																							
Coniopterygidae	Dusty-wings																	1				1	2
Chrysopidae	Common lacewings				1		3					4		1				2	4	1	1	1	10
Lepidoptera																							
Geometridae	Measuringworms		2		1	1	1		4		1	10		1			1		2	2	5		11
Microlepidoptera	Microlepidopteran adults		1					1				2		1								2	3
Lepidopteran larvae	Caterpillars		11	1			2	12	2	2	8	39		6	1	2	1		14	3	2	2	31

Table B-4-27 (Continued)

Scientific Name	Common Name	Chained Pinyon-Juniper (Grid 1)											Pinyon-Juniper Woodland (Grid 2)										
		9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ	9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ
Diptera																							
Cecidomyiidae	Gall midges									1	1	2							1				1
Asilidae	Robber flies									1		1							7				7
Dolichopodidae	Long-legged flies				3							3											
Phoridae	Hump-backed flies							1				1							1				1
Syrphidae	Syrphid flies			1								1											
Tephritidae	Fruit flies	1				2	1					4											
Hymenoptera																							
Braconidae	Braconid wasps			1				1				2							2				2
Ichneumonidae	Ichneumonid wasps										1	1			1								1
Chalcidoidea	Chalcid wasps	1		9	3	1	4	2		1	4	25				1		1	3				5
Cynipidae	Gal wasps										1	1											
Bethylidae	Bethylid wasps																		1				1
Formicidae	Ants		10			1	2	22	12	2	23	72		5		2		1	1				9
Arachnida																							
Acarina	Mites				1	2				2	9	13						1				3	4

Table B-4-27 (Concluded)

Scientific Name	Common Name	Chained Pinyon-Juniper (Grid 1)											Pinyon-Juniper Woodland (Grid 2)										
		9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ	9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ
Araneida																							
Dictynidae	Dictynid spiders		1									1											
Micryphantidae	Dwarf spiders										1	1			5				11				16
Araneidae	Orb-weavers													2						1	1		4
Lycosidae	Wolf spiders										1	1				2	3	2					7
Oxyopidae	Lynx spiders		1		1	1					1	4									1	3	4
Clubionidae	Two-clawed hunting spiders	1									1	2		1	1			1					3
Thomisidae	Crab spiders			1	2		2	1	1		4	11				2		1	1				4
Salticidae	Jumping spiders	4				1	1			1	5	12		2	1	1				1	1	8	14
Number of Individuals		16	30	23	48	93	84	116	30	19	79	538		35	14	27	46	195	87	18	20	45	487
Number of Families		8	9	11	13	14	15	18	10	10	22	38		13	7	12	9	19	20	9	11	16	38
Number of Replicates		3	3	3	3	3	6	6	3	3	6			3	3	3	3	6	6	3	3	6	

Table B-4-28 ARTHROPODS COLLECTED FROM *CERCOCARPUS MONTANUS* ON TRACT C-b, SEPTEMBER 1974 - AUGUST 1976

		Chained Pinyon-Juniper (Grid 1)											Pinyon-Juniper Woodland (Grid 2)										
Scientific Name	Common Name	9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ	9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ
INSECTA																							
Collembola																							
Sminthuridae	Springtails																	1					1
Orthoptera																							
Acrididae	Short-horned grasshoppers																					1	1
Thysanoptera																							
Phloeothripidae	Thrips						6			1		7		1									1
Hemiptera																							
Anthocoridae	Minute pirate bugs				1		5	1	5	1	6	19						10		16	2	1	29
Miridae	Plant bugs			19	7	2	3	16	1	1	1	50		3		12	8	3	10	10	10	20	76
Nabidae	Damsel bugs																	1		4	1		6
Reduviidae	Assassin bugs	1										1											
Tingitidae	Lace bugs		1		20	5		4		7		37		1				1	1		12	4	19
Lygaeidae	Seed bugs						1					1			1			6					7
Pentatomidae	Shield-backed bugs																	1					1

Table B-4-28 (Continued)

Scientific Name	Common Name	Chained Pinyon-Juniper (Grid 1) 9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ	Pinyon-Juniper Woodland (Grid 2) 9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ
Homoptera																							
Cicadellidae	Leafhoppers		3	2	4	3	2	3	2	4	5	28		3		1	2	4	12	3	2	6	33
Psyllidae	Psyllids	22	12		35	4	29	29	38	19	32	220		11		42	46	54	26	19	58	117	373
Aphididae	Aphids				2		1		1			4					2	2			1		5
Ericsomatidae	Gall-making aphids				1							1											
Chermidae	Jumping plant lice													1						18			19
Coccoidea	Scale insects							6				6											
Coleoptera																							
Malachiidae	Soft-winged flower beetles								1			1											
Cleridae	Checkered beetles				1			1				2						1				1	2
Coccinellidae	Ladybird beetles	1			1		12			1		15					1	1					2
Pedilidae	Pedilid beetles			1								1											
Bostrichidae	Branch borers																1						1
Chrysomelidae	Leaf beetles						1					1											
Anthribidae	Fungus weevils										1	1											
Curculionidae	Snout beetles					1					1	2				1		1		1		2	5
Neuroptera																							
Raphididae	Raphididae snakeflies															1							1
Chrysopidae	Common lacewings						1					1		1				1					2

Table B-4-28 (Continued)

		Chained Pinyon-Juniper (Grid 1)											Pinyon-Juniper Woodland (Grid 2)										
Scientific Name	Common Name	9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ	9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ
Lepidoptera																							
Geometridae	Measuringworms				1	1	4		1	1	4	12						1		1		1	3
Microlepidoptera	Microlepidopteran adults							4	1	1	1	7										1	1
Lepidopteran larvae	Caterpillars		4	4	3	1	3	5	10	1	6	37		4			1		1	3	2	25	36
Diptera																							
	Midges									1		1											
	Dark-winged fungus gnats						1					1											
	Gall midges																		1				1
	Bee flies										1	1											
	Long-legged flies				1				1			2											
	Milichiid flies						1					1											
	Chloropid flies																	1		1			2
	Fly larvae																1						1
	Fly pupae					1						1											
Hymenoptera																							
Braconidae	Braconid wasps																				2	1	3
Ichneumonidae	Ichneumoid wasps				1							1											
Chalcidoidea	Chalcid wasps								2	1		3					2		3		1		6
Cynipidae	Gall wasps																	1					1
Formicidae	Ants				1		2		1			4				1		3	9	4	16	5	38

Table B-4-28 (Concluded)

Scientific Name	Common Name	Chained Pinyon-Juniper (Grid 1)											Pinyon-Juniper Woodland (Grid 2)										
		9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ	9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ
ARACHNIDA																							
Acarina	Mites										3	3						1					1
Ixoides	Ticks																			1			1
Araneida																							
Theridiidae	Comb-footed spiders														1								1
Micryphantidae	Dwarf spiders							1				1							10				10
Lycosidae	Wolf spiders																				2	2	4
Oxyopidae	Lynx spiders																	2	1	4	5	54	66
Clubionidae	Two-clawed hunting spiders						1					1				1		1					2
Thomisidae	Crab spiders	2					3			1	5	11				3	1	4	2	1		14	25
Salticidae	Jumping spiders						1	2		3	5	11				1	1	2	1	1	2	6	14
Number of Individuals		26	20	26	79	18	77	72	64	43	71	496		25	2	63	66	103	77	87	116	261	800
Number of Families		4	4	4	14	8	18	11	12	14	13	36		8	2	9	11	23	12	15	14	17	38
Number of Replicates		3	3	3	3	3	6	6	3	3	6			3	3	3	3	6	6	3	3	6	

Table B-4-29 ARTHROPODS COLLECTED FROM ARTEMISIA TRIDENTATA ON TRACT C-b, SEPTEMBER 1974 - AUGUST 1976

Scientific Name	Common Name	Chained Pinyon-Juniper (Grid 1)											Pinyon-Juniper Woodland (Grid 2)										
		9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ	9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ
INSECTA																							
Orthoptera																							
Acrididae	Short-horned grasshoppers															2					1		3
Psocoptera	Psocids																		1				1
Thysanoptera																							
Phloeothripidae	Thrips		2		2	9	101	5	7		3	129		1		10	2	9	4	7	8	2	43
Hemipitera																							
Anthocoridae	Minute pirate bugs	6		1		1	8		6			22					1	1		1	1		4
Miridae	Plant bugs	31	4	4	20	28	168	49	62	33	106	505		14	4	8	11	22	42	17	22	16	156
Nabidae	Damsel bugs						3		8	7	1	19					2	1		4	2	1	10
Reduviidae	Assassin bugs						1		1		1	3				1		1			1	1	4
Tingitidae	Lace bugs						1		30	3		34								1			1
Lygaeidae	Seed bugs			1		6						7					1		1				2
Coreidae	Leaf-footed bugs										2	2											
Pentatomidae	**Shield-backed bugs**										1	1											

Table B-4-29 (Continued)

Scientific Name	Common Name	Chained Pinyon-Juniper (Grid 1)											Pinyon-Juniper Woodland (Grid 2)										
		9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ	9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ
Homoptera																							
Cicadellidae	Leafhoppers	10	1	9		3	13	15	12	7	27	97		1	3	4	1	12	38	13	21	20	113
Fulgoridae	Fulgorid planthoppers									1		1				1			1			2	4
Psyllidae	Psyllids		1					3				4											
Aphididae	Aphids			3	2	10	16	7	8			46				4	1		2	2	1	1	11
Eriosomatidae	Gall-making aphids															2							2
Chermidae	Jumping plant lice																1						1
Coccoidea	Scale insects							1		1		2											
Coleoptera																							
Malachiidae	Soft-winged flower beetles							2	1			3						1					1
Cleridae	Checkered beetles					1		6			1	8					1				2	1	4
Buprestidae	Metallic wood-boring beetles																		1				1
Coccinellidae	Ladybird beetles	3				4	6				3	16		1									1
Chrysomelidae	Leaf beetles	4				2				1	1	8				1				1	1	1	4
Curculionidae	Snout beetles						1			1	3	5									1	2	3
Neuroptera																							
Coniopterygidae	Dusty-wings																					2	2
Chrysopidae	Common lacewings			1				1				2					1	1	2		1	1	6

Table B-4-29 (Continued)

Scientific Name	Common Name	Chained Pinyon-Juniper (Grid 1)											Pinyon-Juniper Woodland (Grid 2)										
		9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ	9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ
Lepidoptera																							
Geometridae	Measuringworms				1	1	5				2	9							1				1
Microlepidoptera	Microlepidopteran adults								3		1	4									1	3	4
Lepidopteran larvae	Caterpillars				1			11	2			14		21	1				40	2		1	65
Diptera																							
Cecidomyiidae	Gall midges				1							1											
Empididae	Dance flies							1				1											
Dolichopididae	Long-legged flies		1									1											
Phoridae	Hump-backed flies							1				1						1					1
Syrphidae	Syrphid flies	1										1											
Tephritidae	Fruit flies						1		1		2	4								1			1
Hymenoptera																							
Cephidae	Stem sawflies							1				1											
Braconidae	Braconid wasps	1						1	3		3	8										1	1
Ichneumonidae	Ichneumonid wasps						2				1	3				1							1
Chalcidoidea	Chalcid wasps	24		1	1	3	23	1	1		10	64				1		1	4	3	3	4	16
Cynipidae	Gall wasps					1						1											
Platygasteridae	Platygasterid wasps		1								1	2											
Formicidae	Ants						1	2	3		4	10		1		8		1	4	4	1	3	22

Table B-4-29 (Concluded)

Scientific Name	Common Name	Chained Pinyon-Juniper (Grid 1) 9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ	Pinyon-Juniper Woodland (Grid 2) 9/74	5/75	6/75	7/75	8/75	9/75	5/76	6/76	7/76	8/76	Σ
Arachnida																							
Acarina	Mites							39	1			40							24		6		30
Araneida																							
Dictynidae	Dictynid spiders				1							1									9		9
Micryphantidae	Dwarf spiders							2				2							5				5
Lycosidae	Wolf spiders										2	2											
Oxyopidae	Lynx spiders	4	2				1		2			9		1		3		2		1		18	25
Clubionidae	Two-clawed hunting spiders						8	2			1	11			1				9				10
Thomisidae	Crab spiders	3	1	3		3	1	5	2		14	32		3		6	6	1	2	5	6	7	36
Salticidae	Jumping spiders						2	3	2	1	12	20				3	1	5	2		4	7	22
Number of Individuals		87	13	23	29	72	362	158	155	55	202	1156		43	9	55	29	59	183	62	92	94	626
Number of Families		10	8	8	8	13	19	21	19	9	23	44		8	3	15	12	14	18	14	19	20	38
Number of Replicates		3	3	3	3	3	6	6	3	3	6	39		3	3	3	3	6	6	3	3	6	36

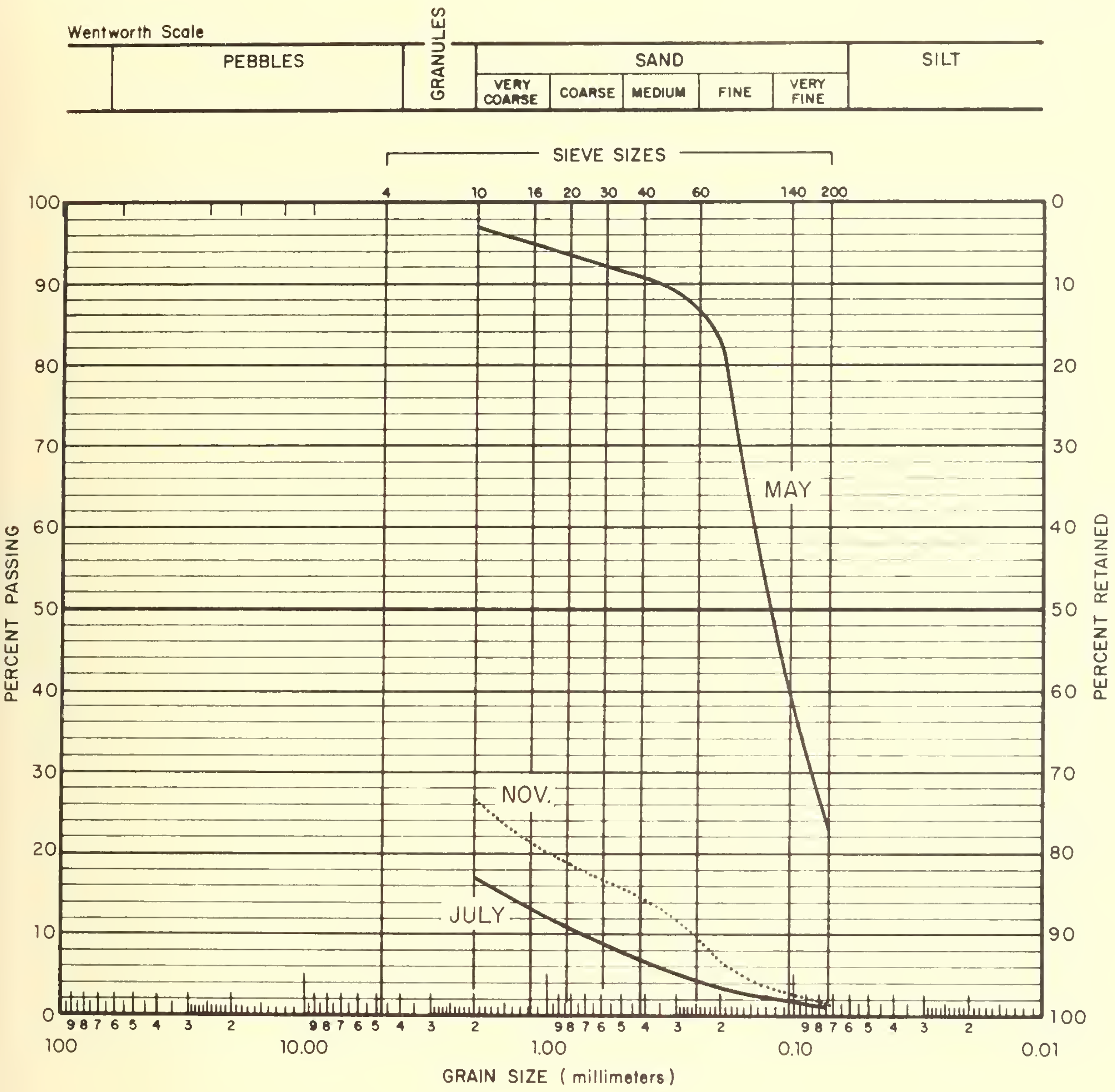

Figure B-5-1
SEDIMENT GRAIN SIZE DISTRIBUTION
STATION P-1
MAY 1975 - JULY 1976

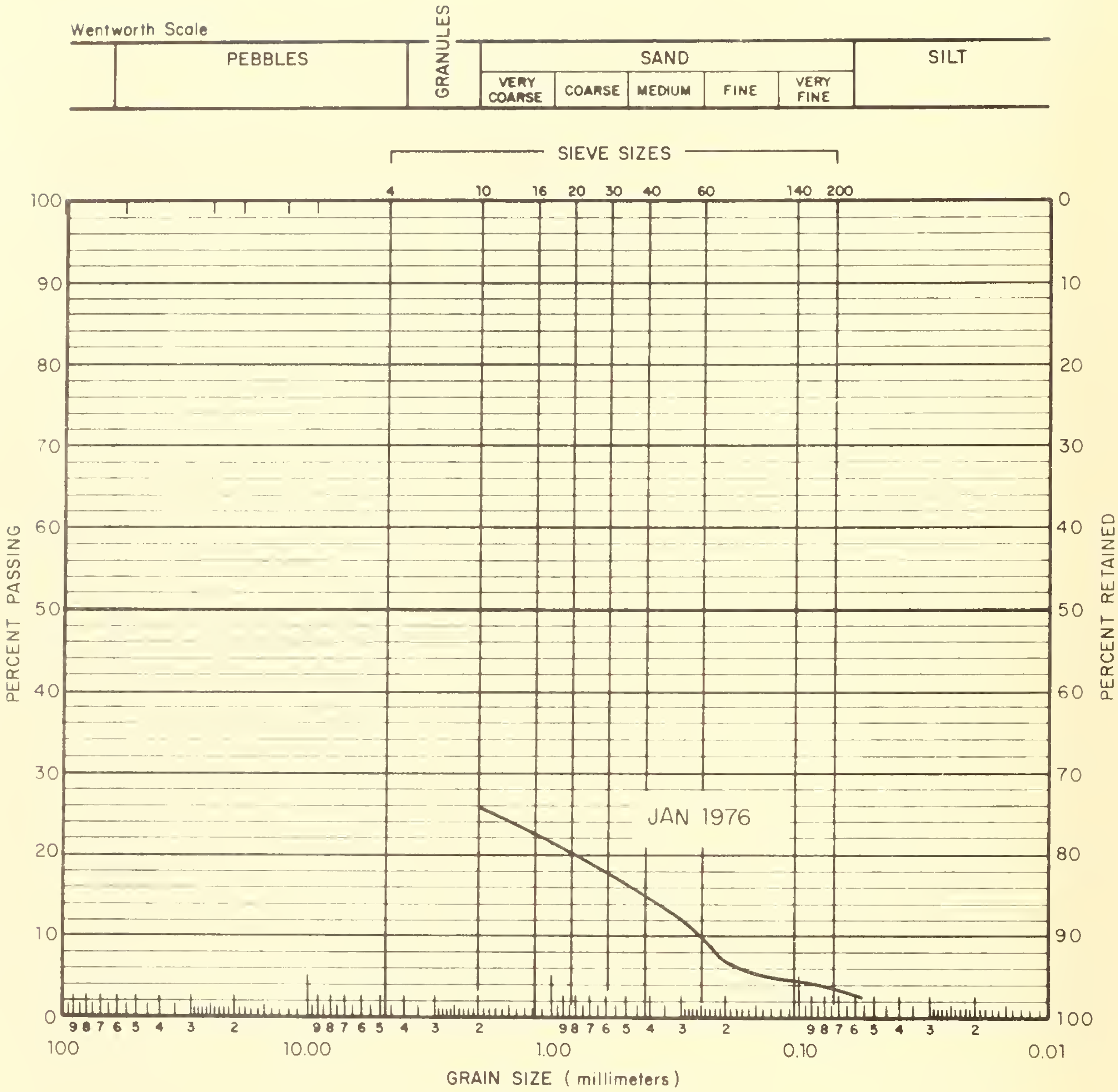

Figure B-5-1
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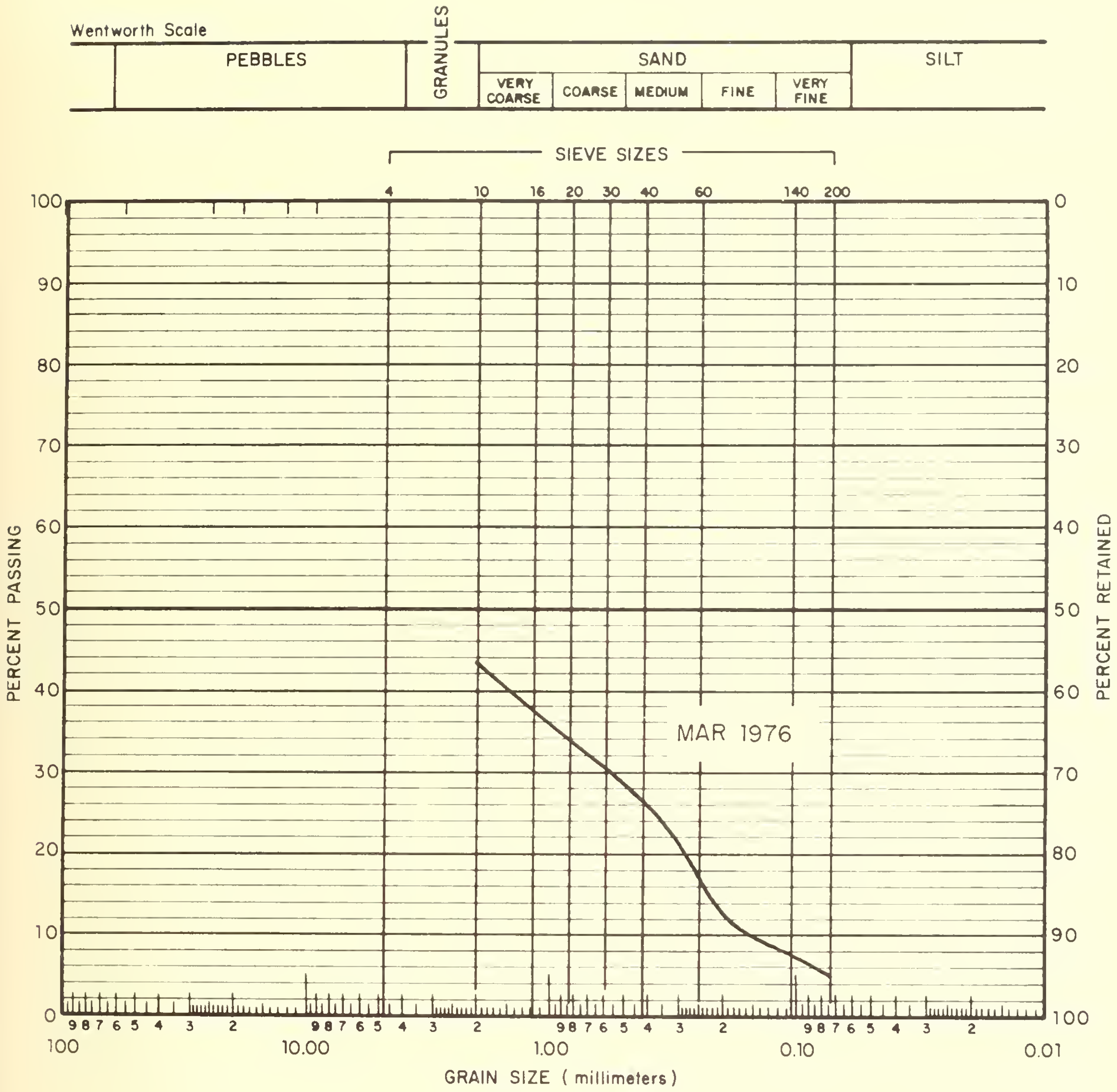

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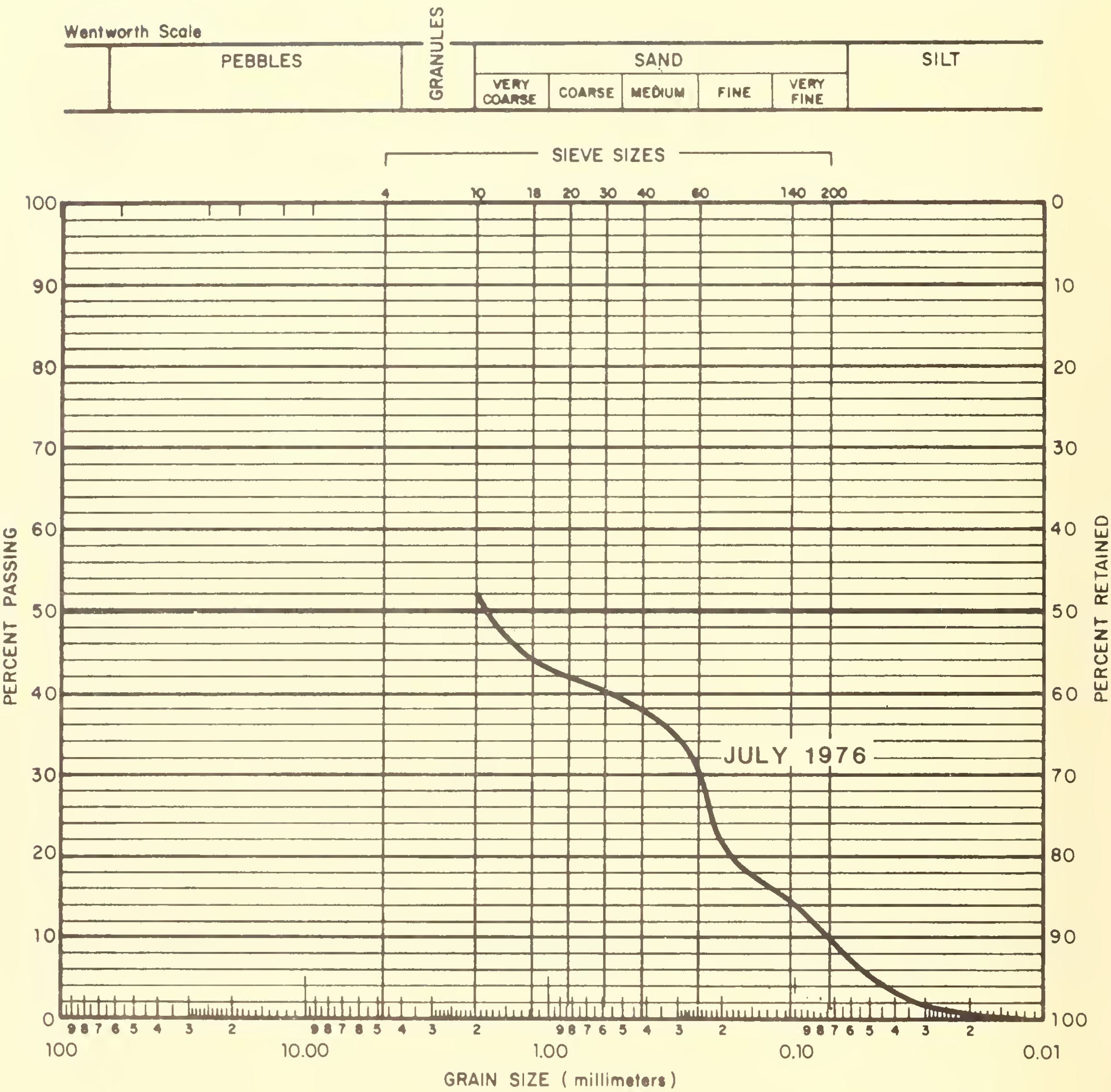

Figure B-5-1
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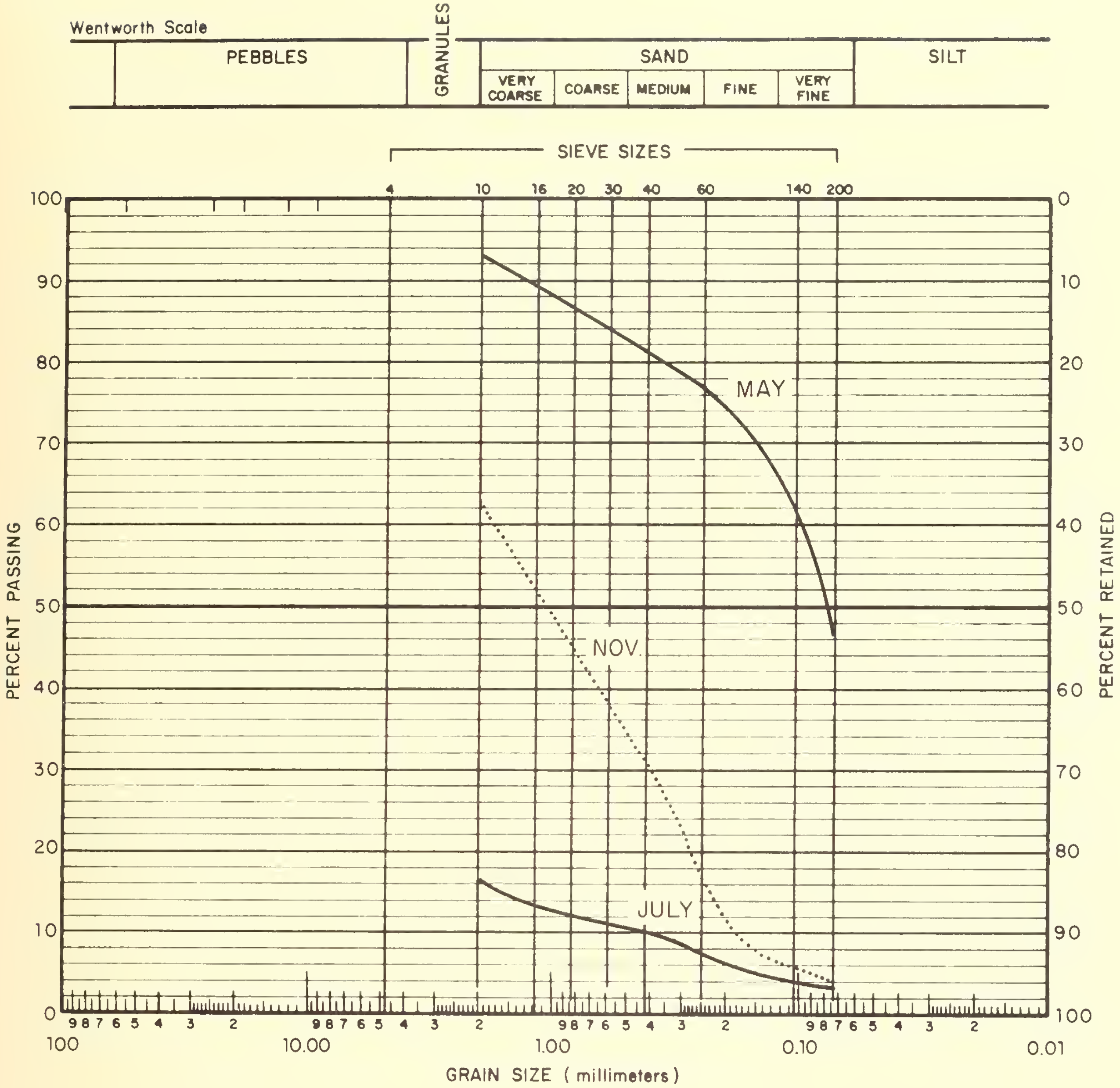

Figure B-5 -2
SEDIMENT GRAIN SIZE DISTRIBUTION,
STATION P-3
MAY 1975 - JULY 1976

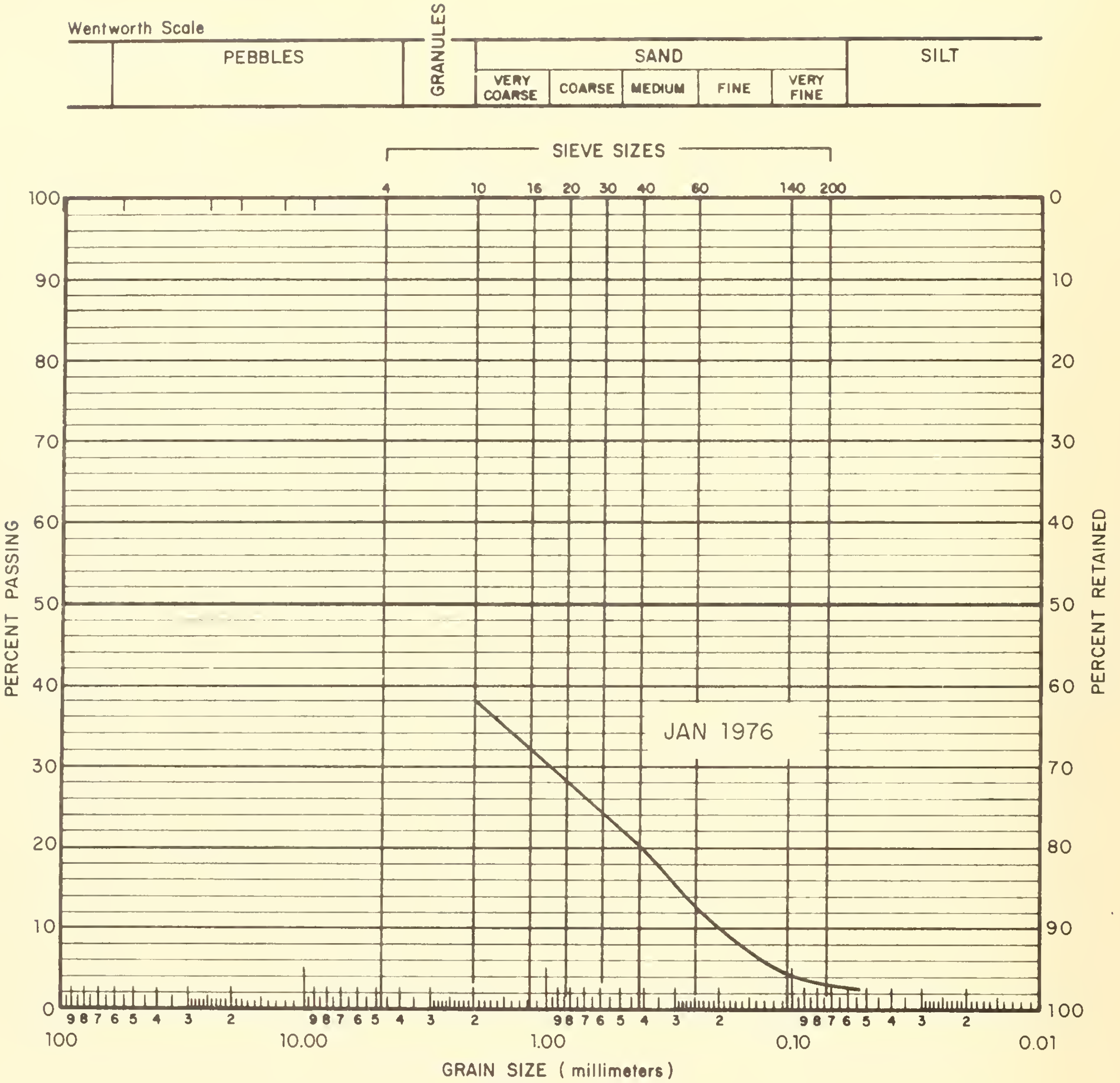

Figure B-5-2
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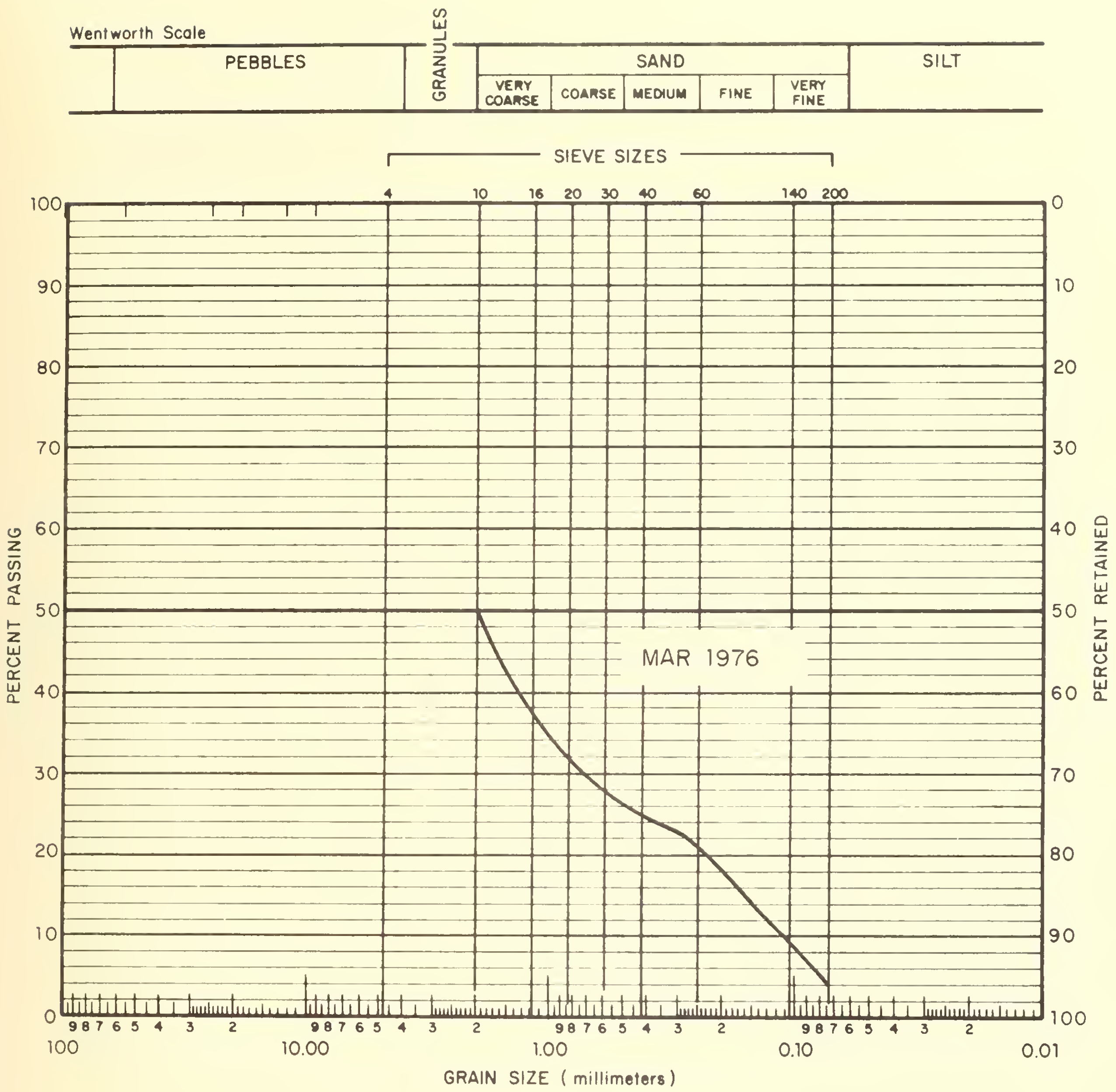

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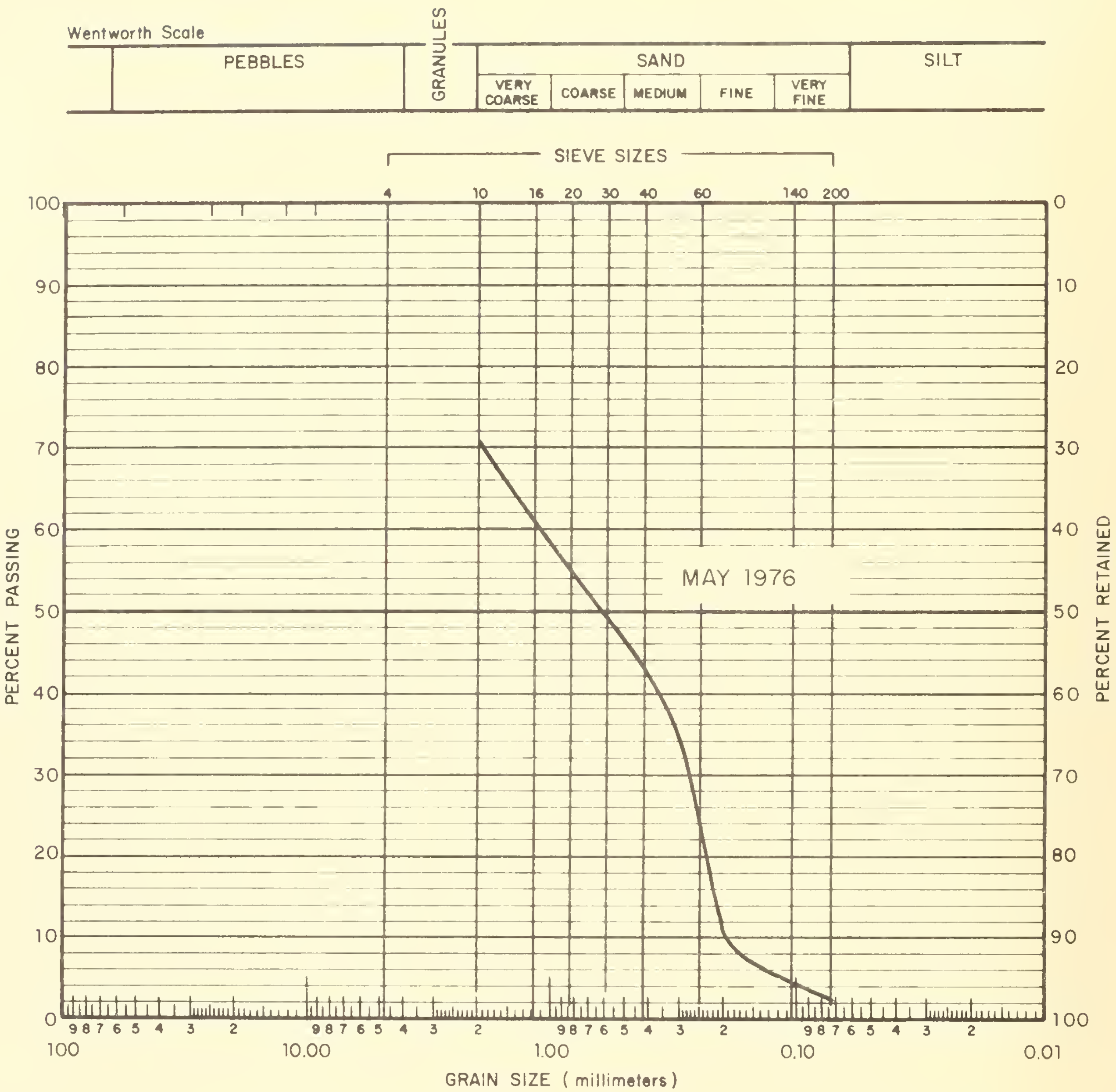

Figure B-5-2 (continued)

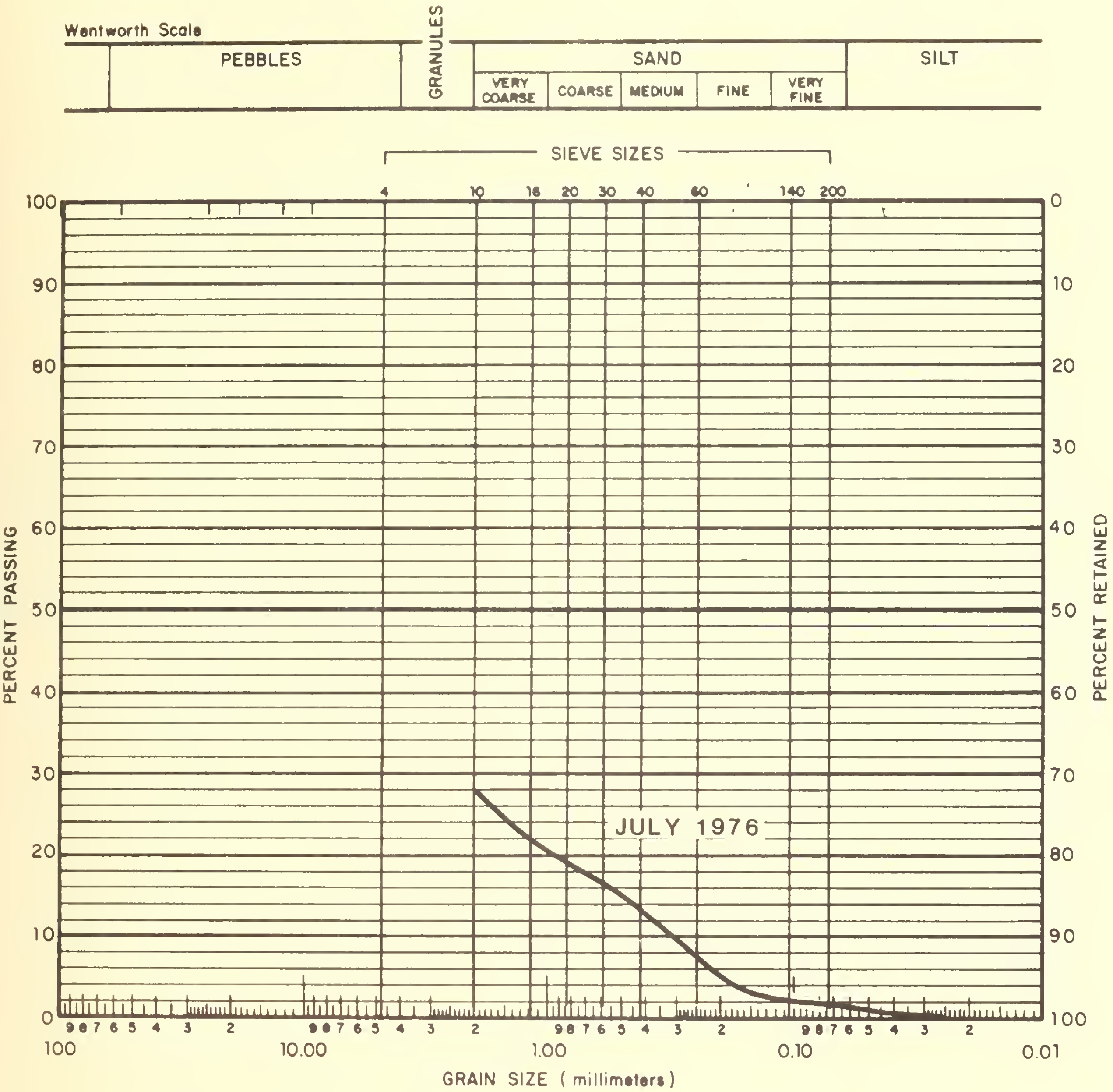

Figure B-5-2
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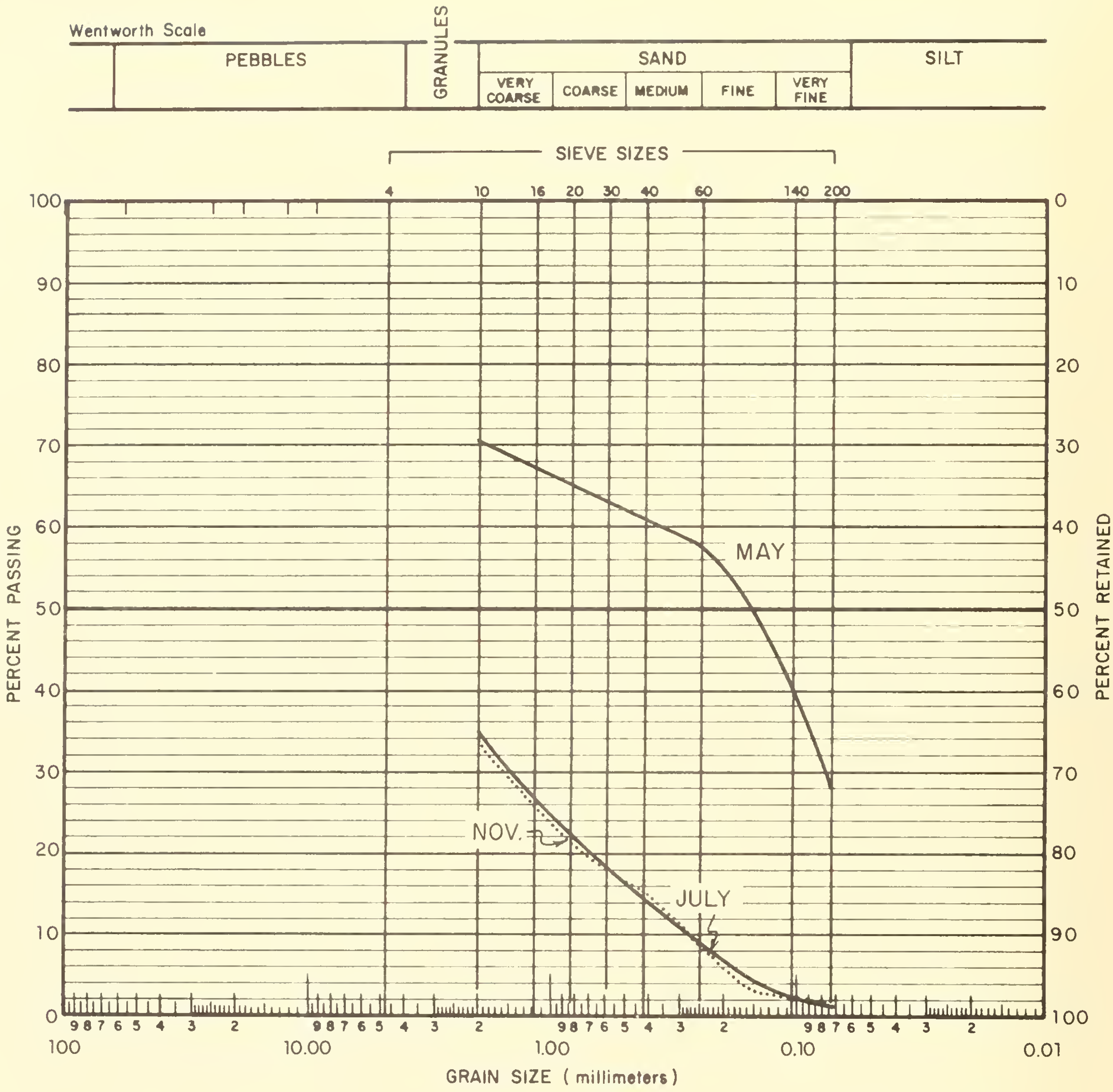
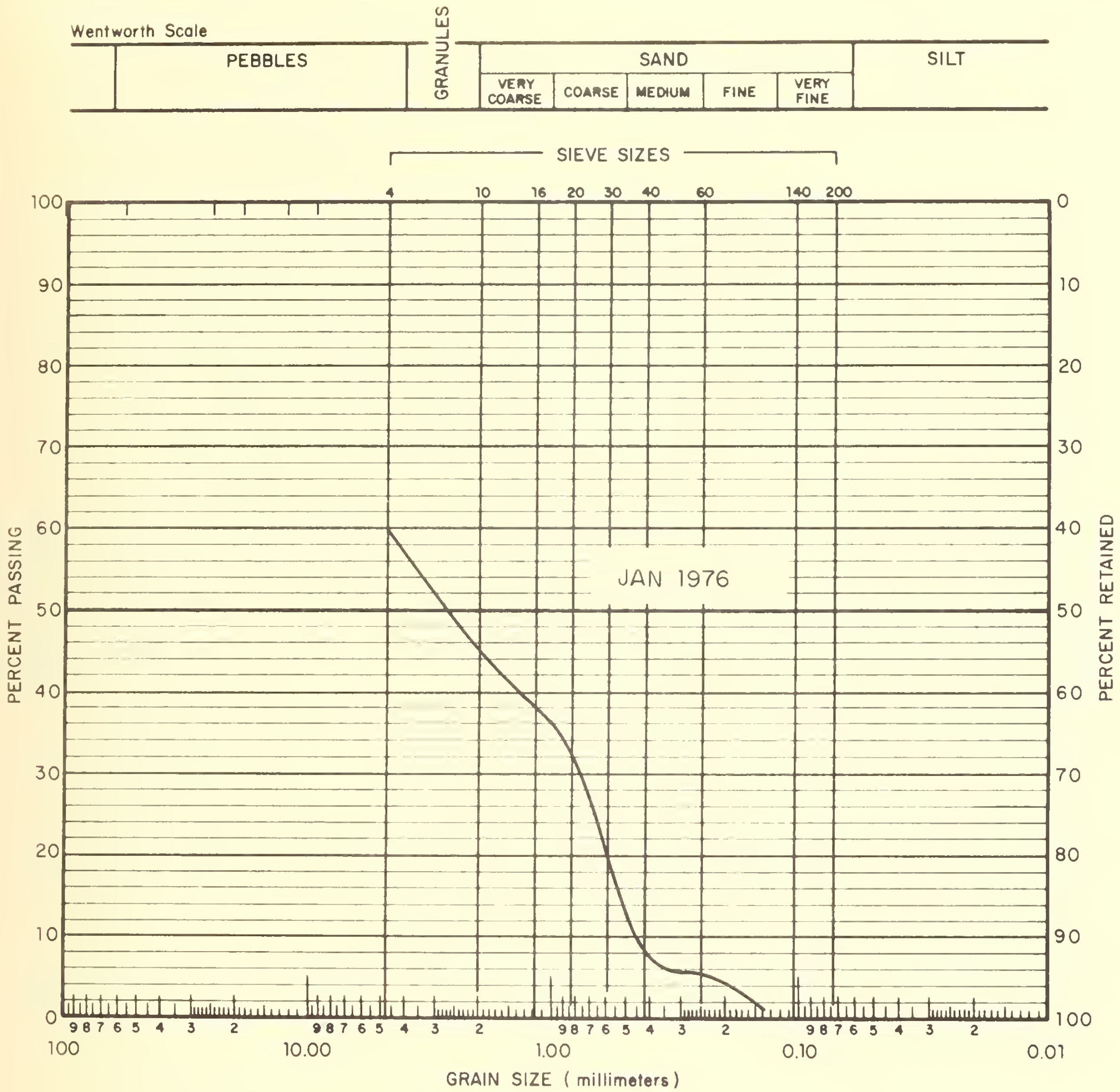


Figure B-5-3
SEDIMENT GRAIN SIZE DISTRIBUTION
STATION P-5A
MAY 1975 - JULY 1976



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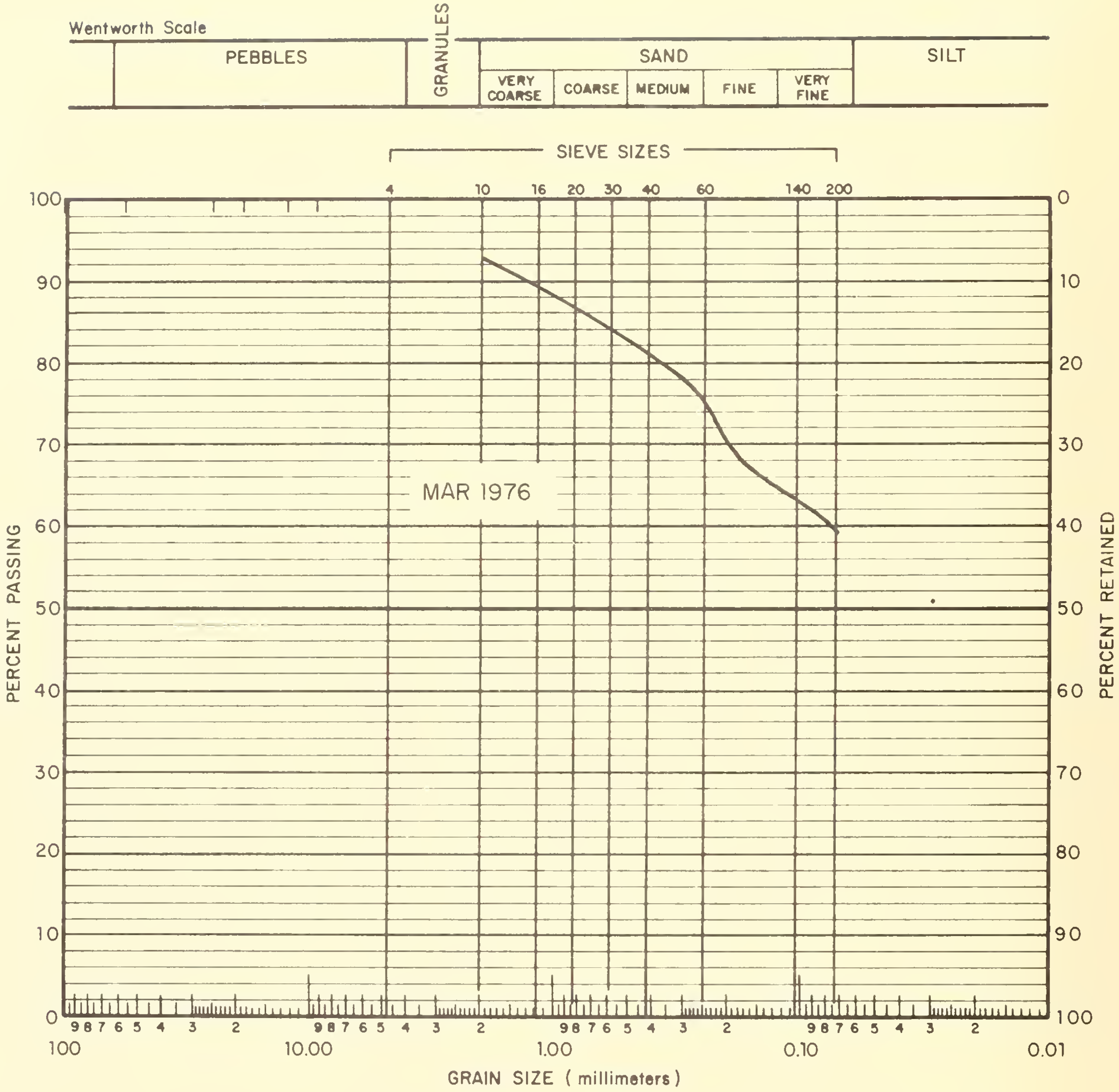

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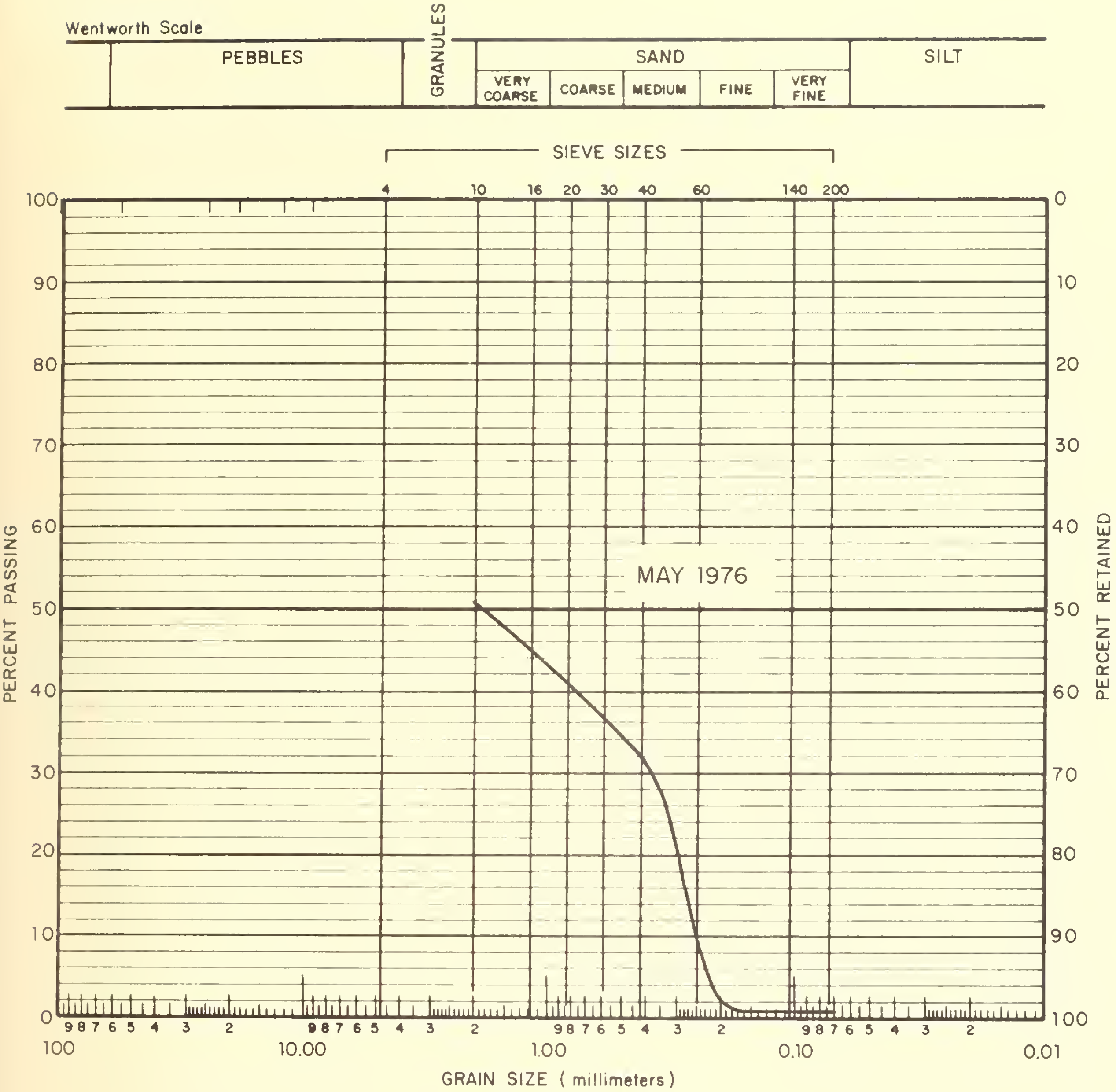

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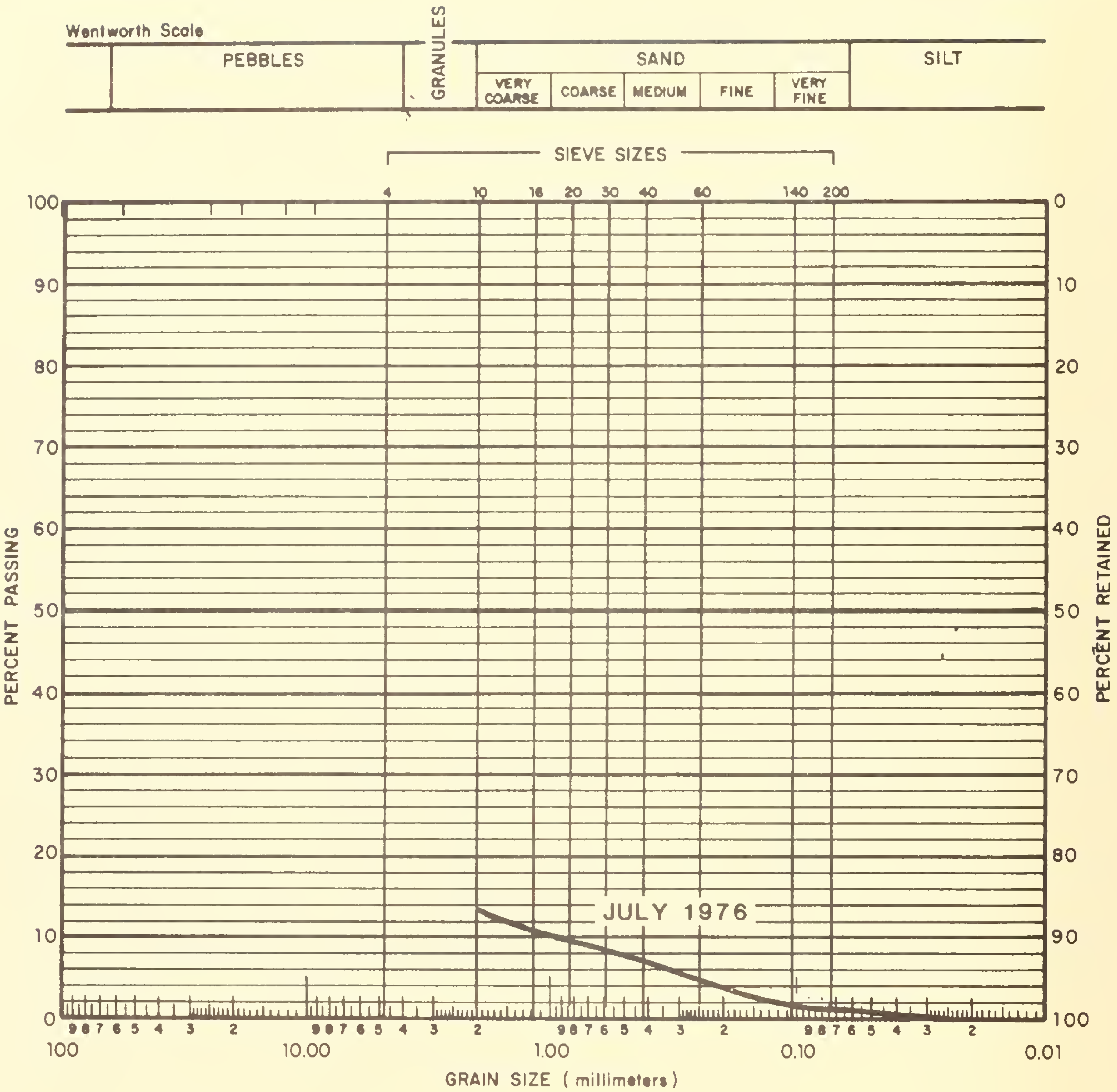

Figure B-5-3
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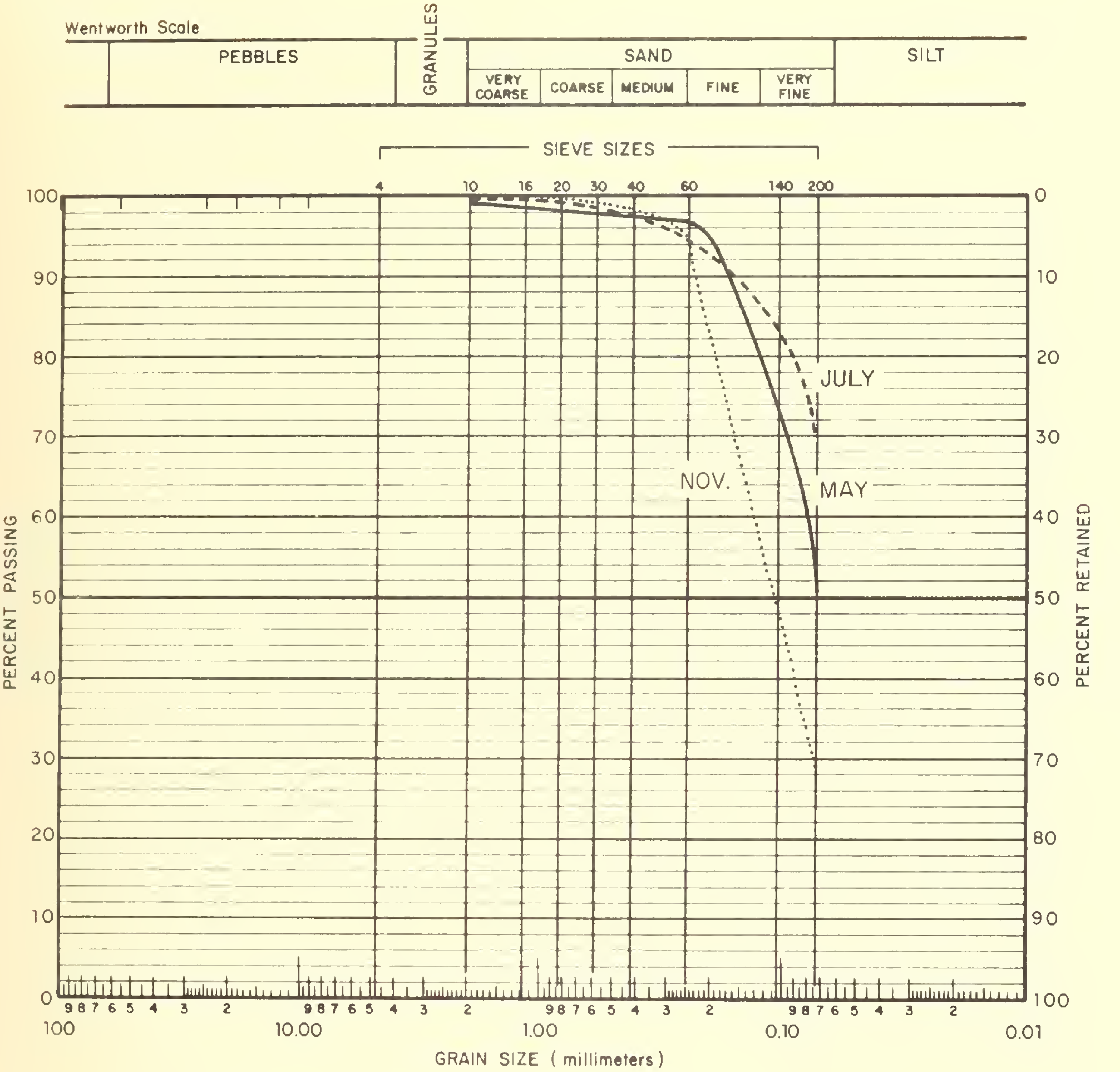
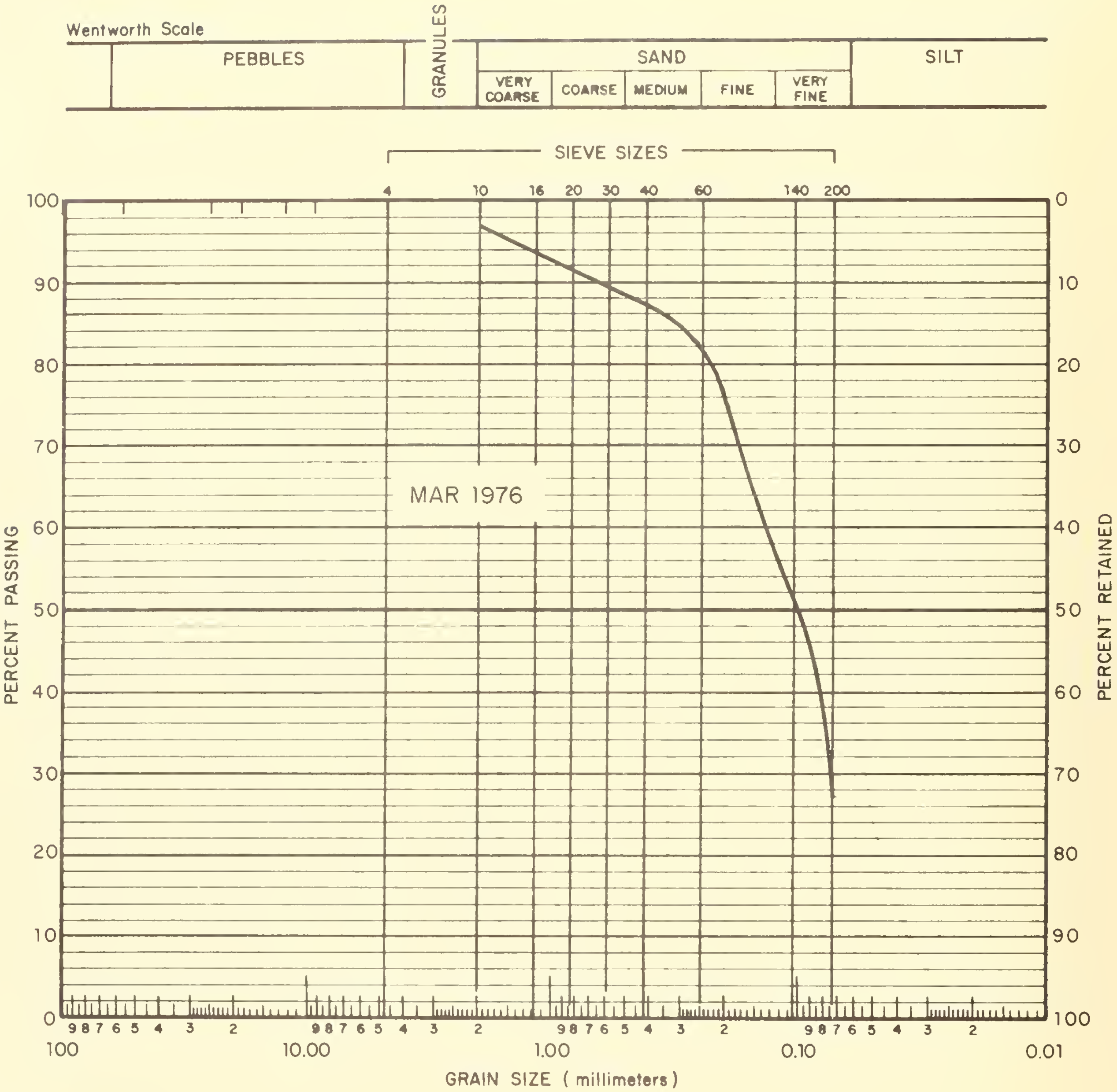


Figure B-5-4
SEDIMENT GRAIN SIZE DISTRIBUTION
STATION P-7
MAY 1975 - JULY 1976



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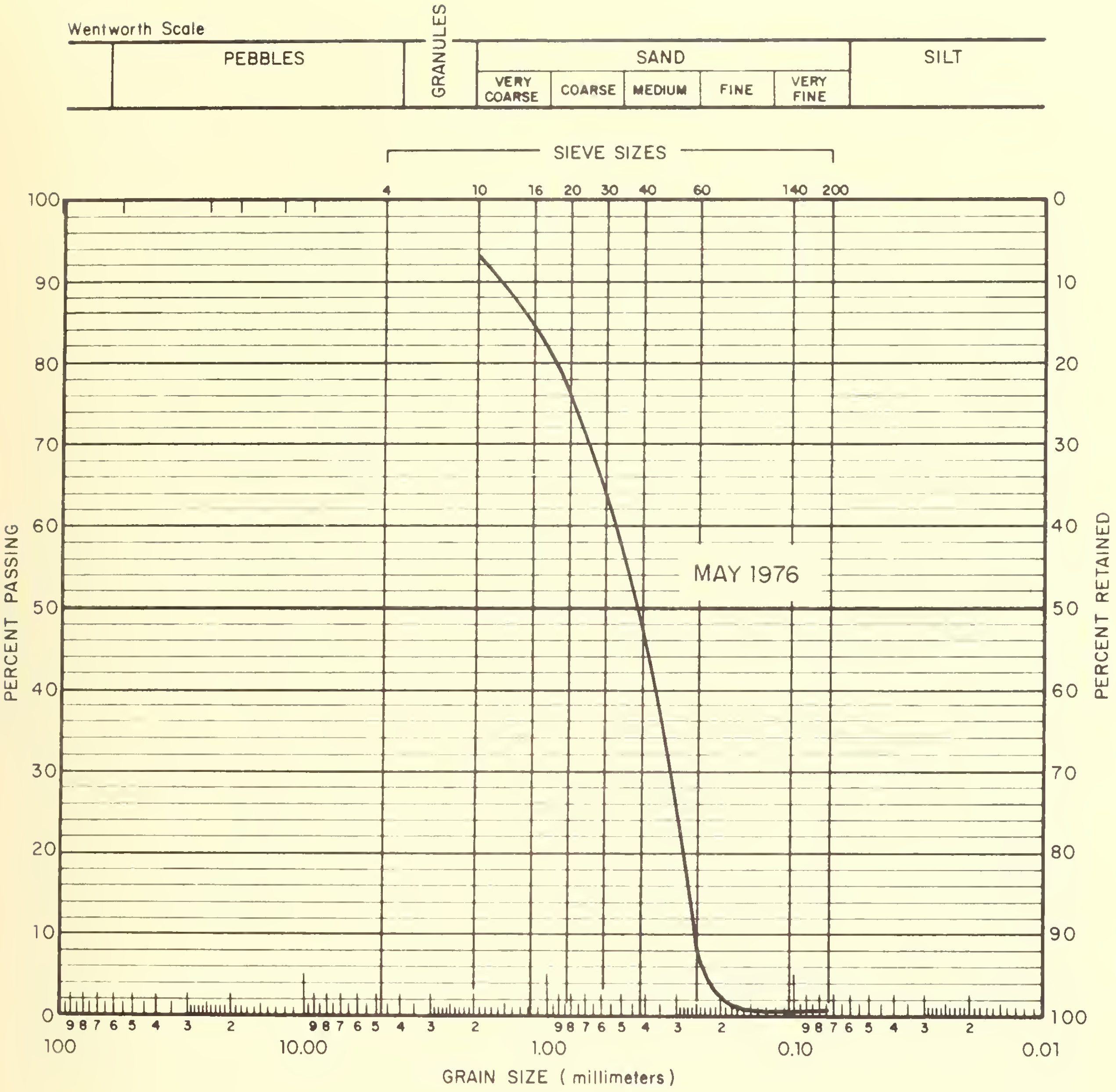

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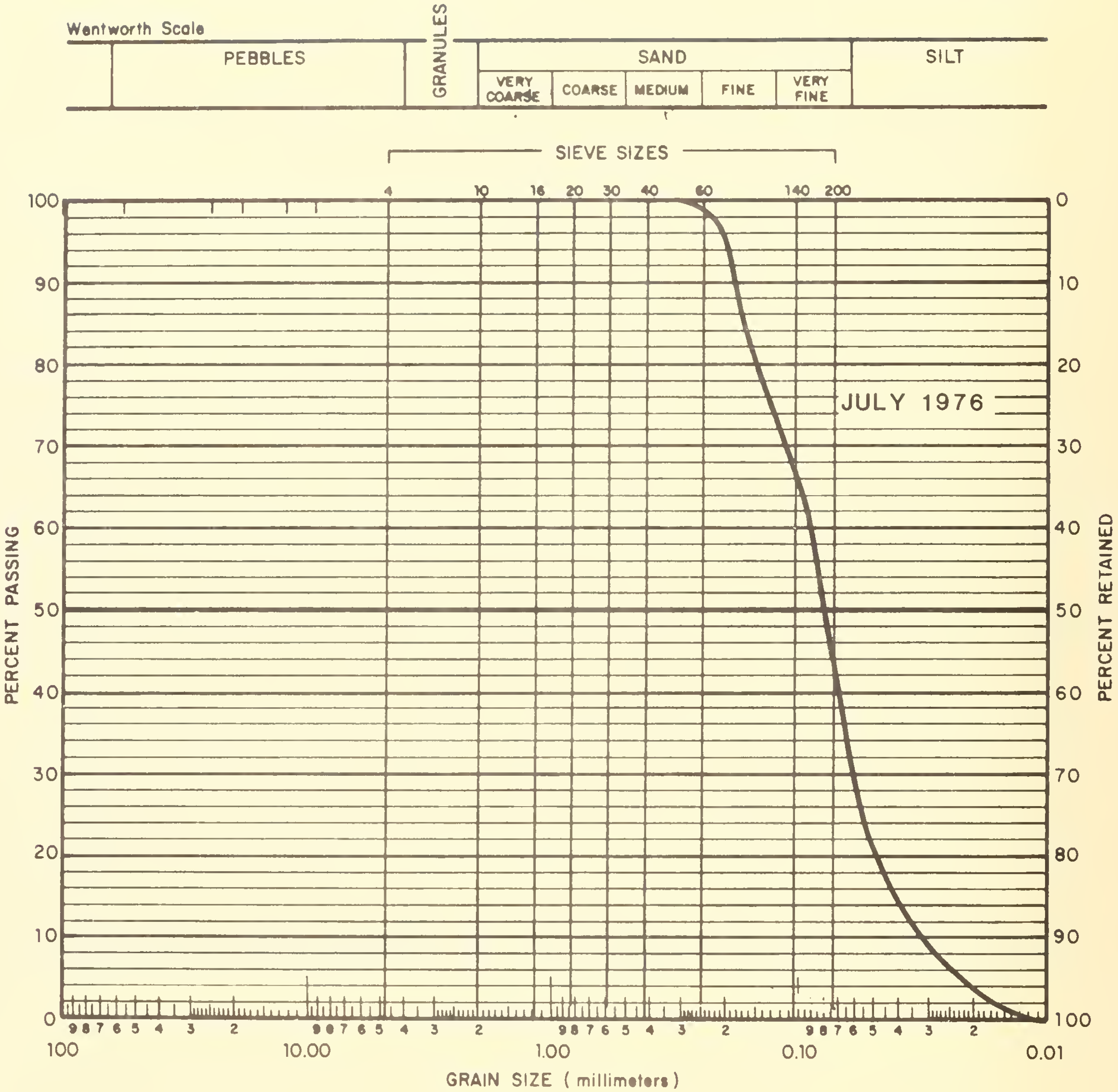

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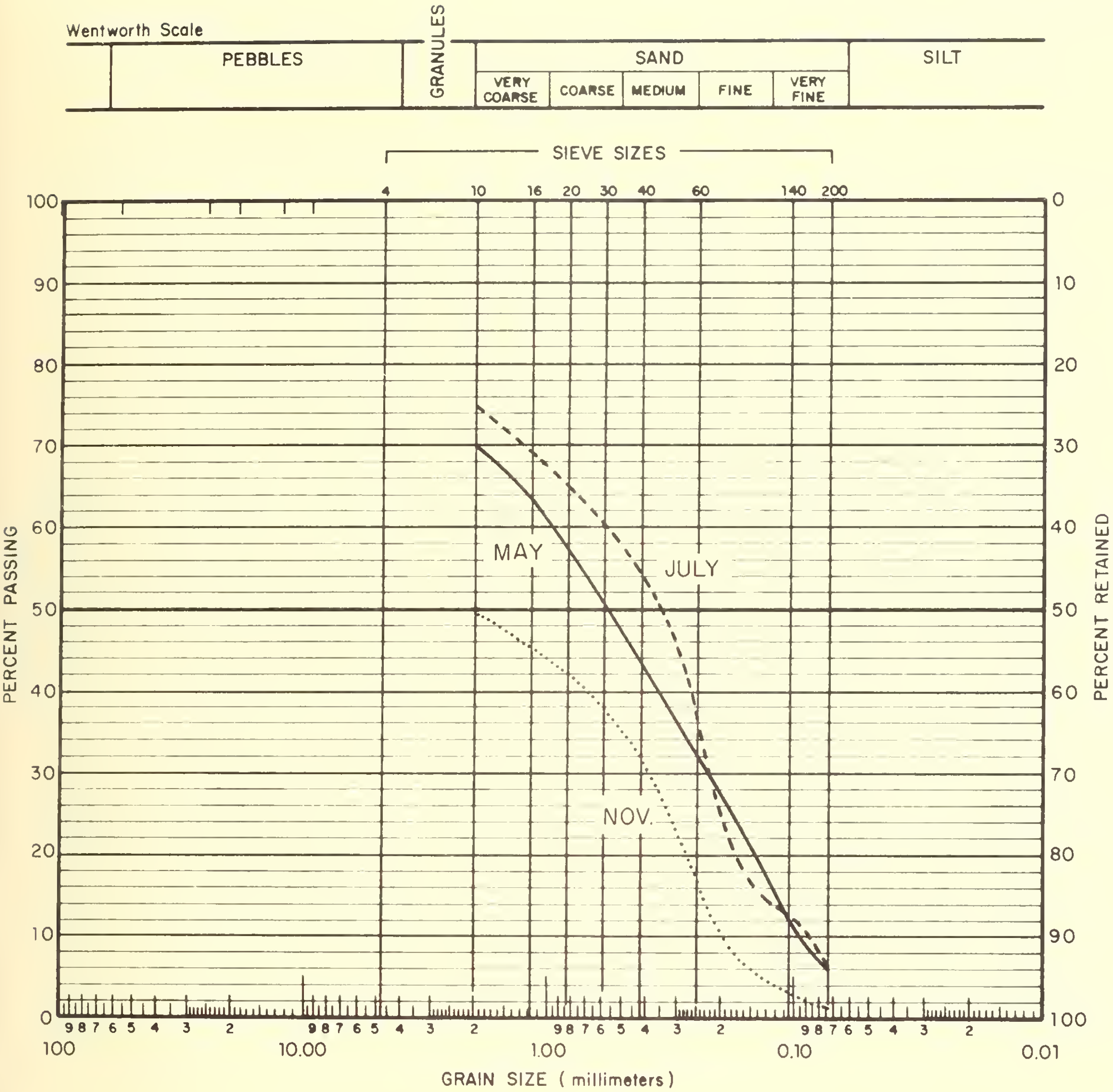


Figure B-5-5
SEDIMENT GRAIN SIZE DISTRIBUTION
STATION S-2
MAY 1975 - MAY 1976

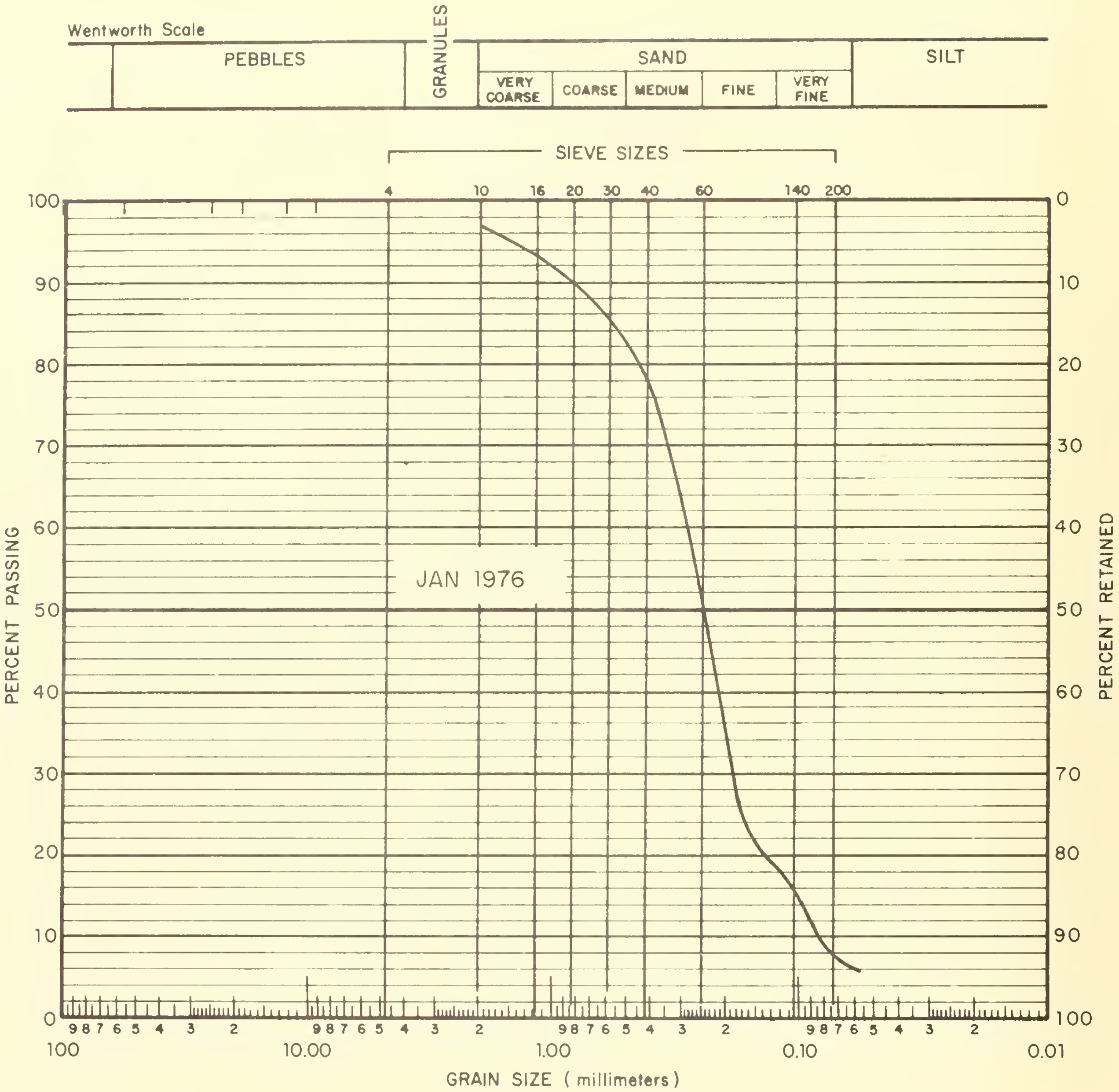
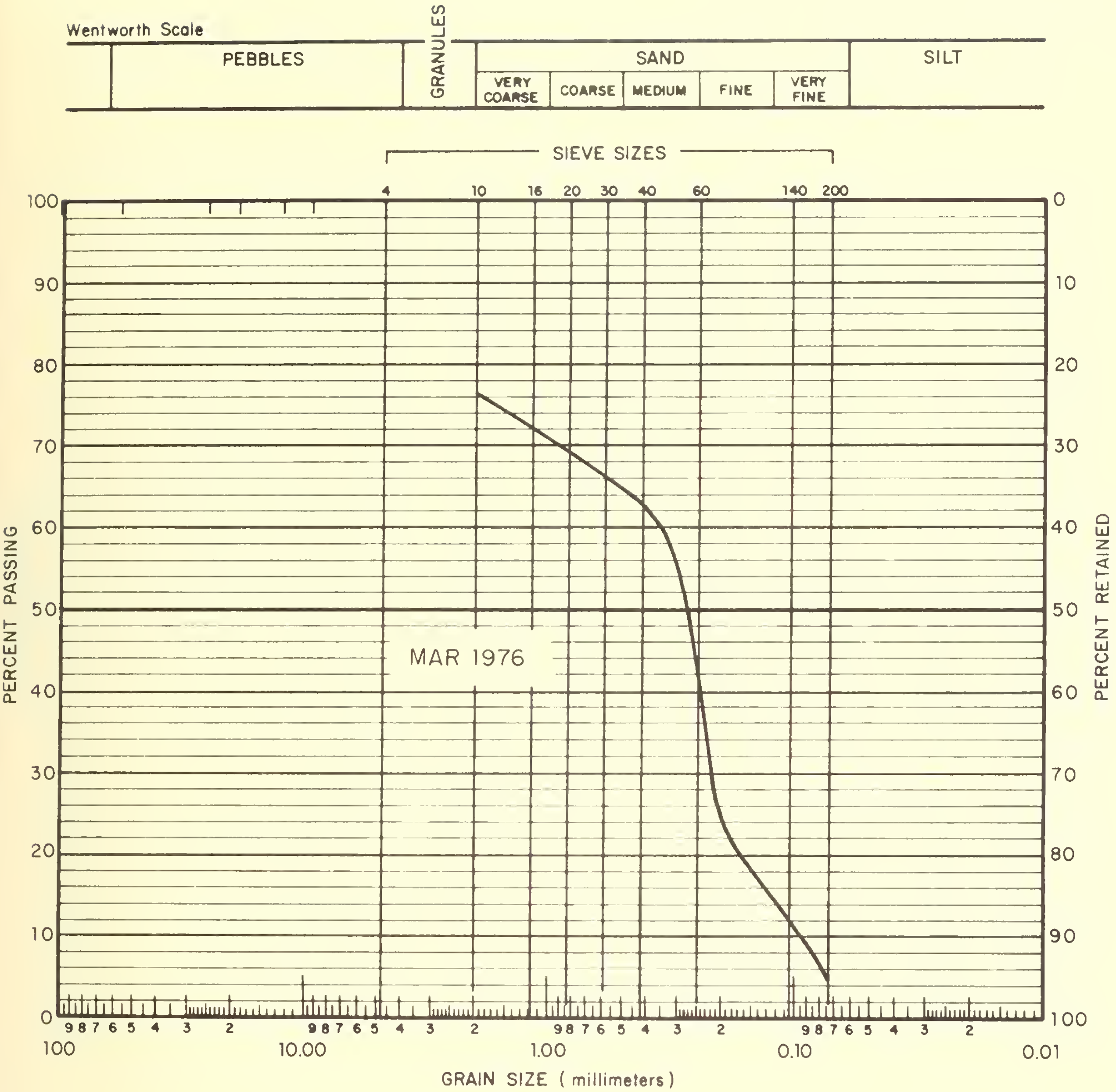


Figure B-5-5
(continued)



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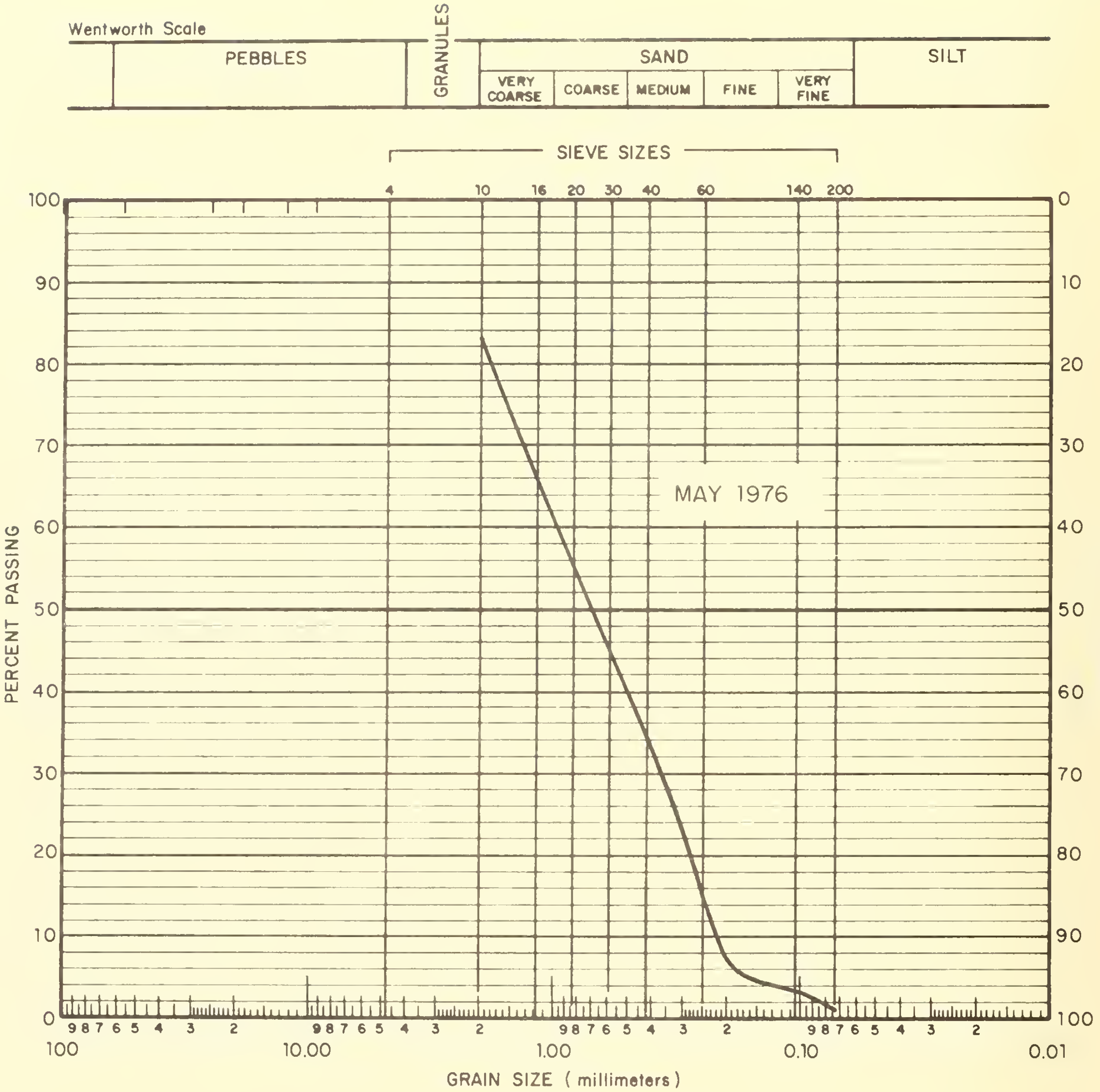

Figure B-5-5
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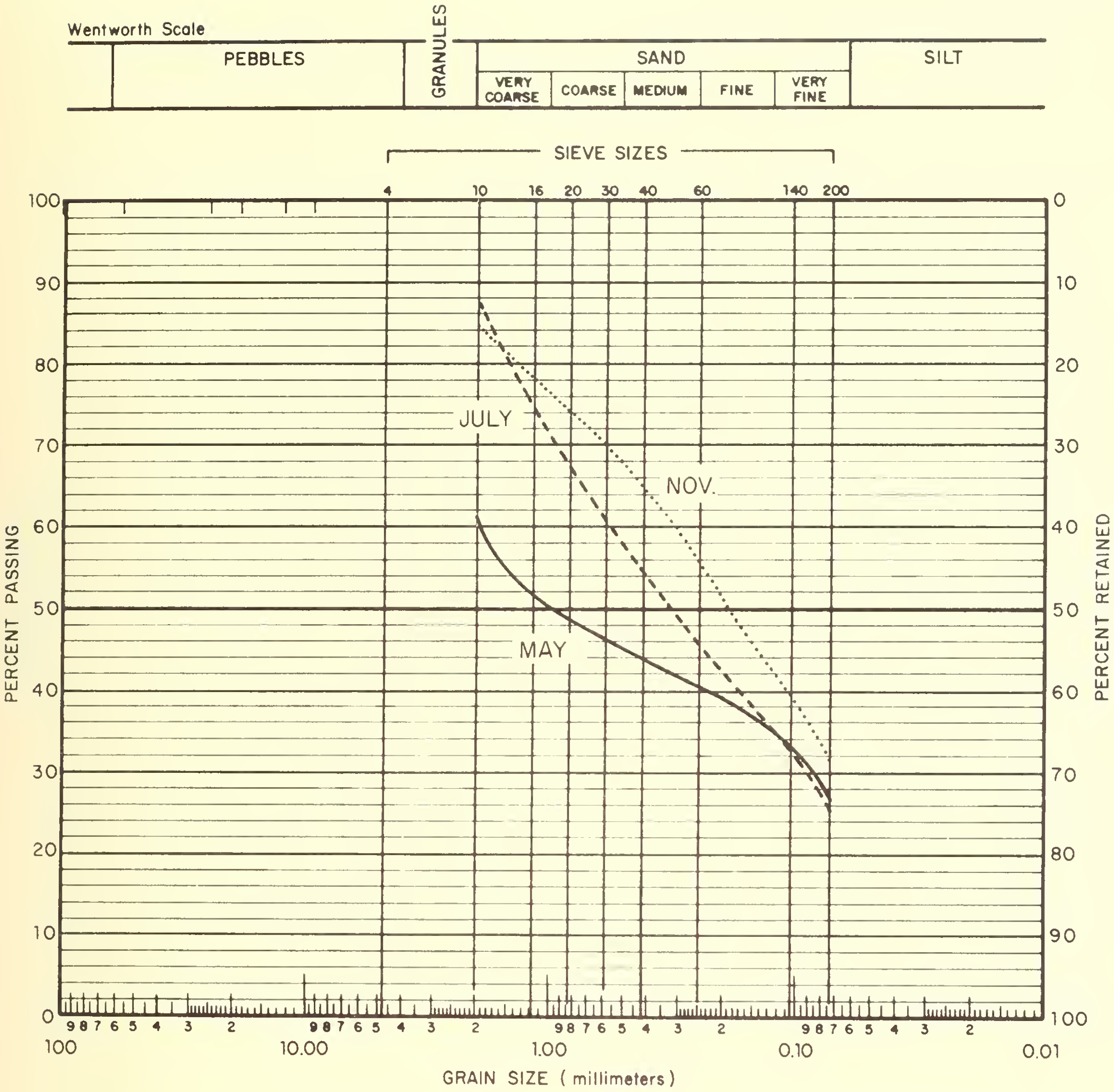


Figure B-5-6
SEDIMENT GRAIN SIZE DISTRIBUTION,
STATION U. S. L.
MAY, JULY, NOVEMBER 1975

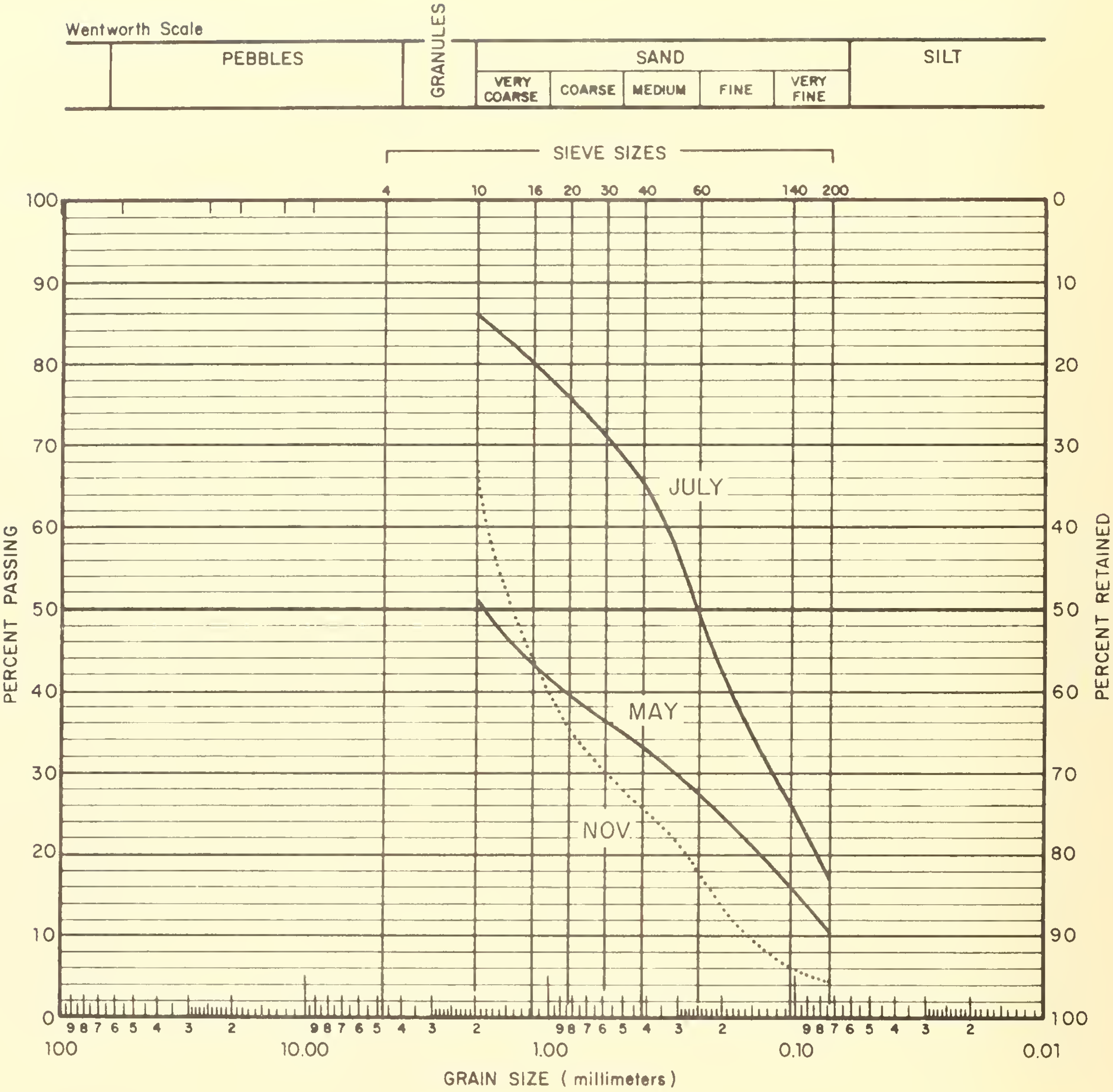
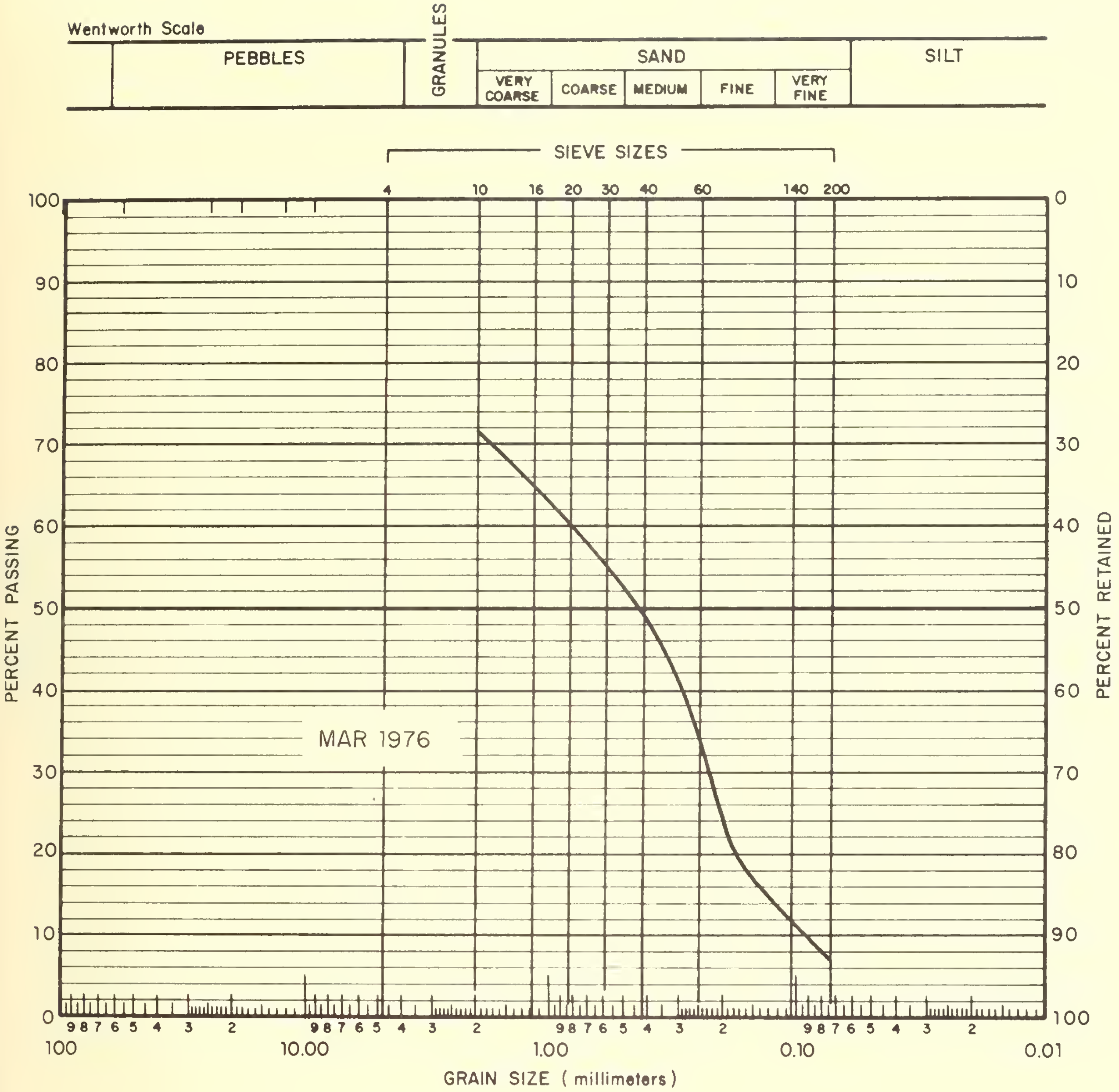


Figure B-5-7
SEDIMENT GRAIN SIZE DISTRIBUTION
STATION L.S.L.
MAY 1975 - MARCH 1976



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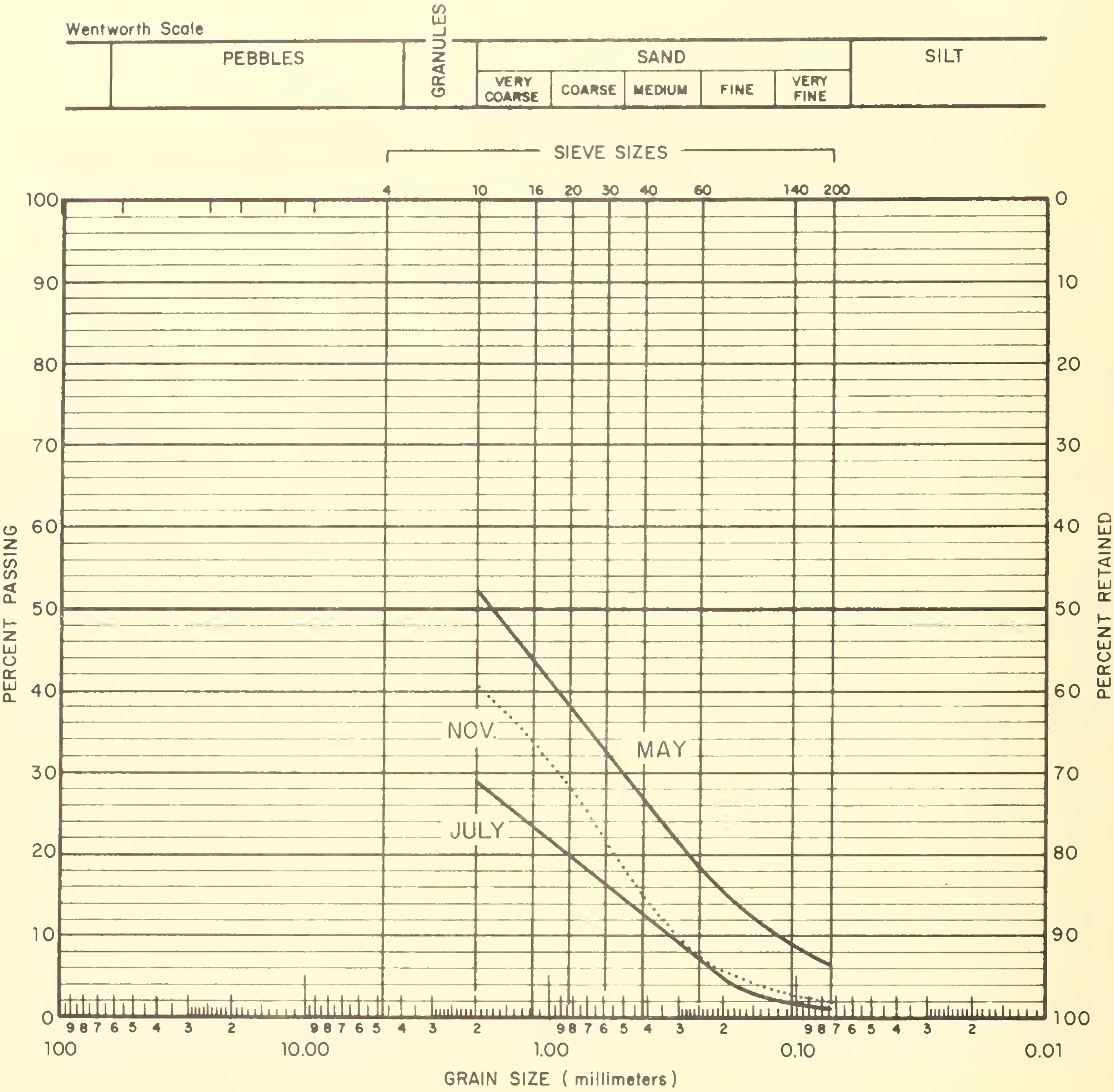

Figure B-5-8
SEDIMENT GRAIN SIZE DISTRIBUTION,
STATION W-1
MAY 1975 - MARCH 1976

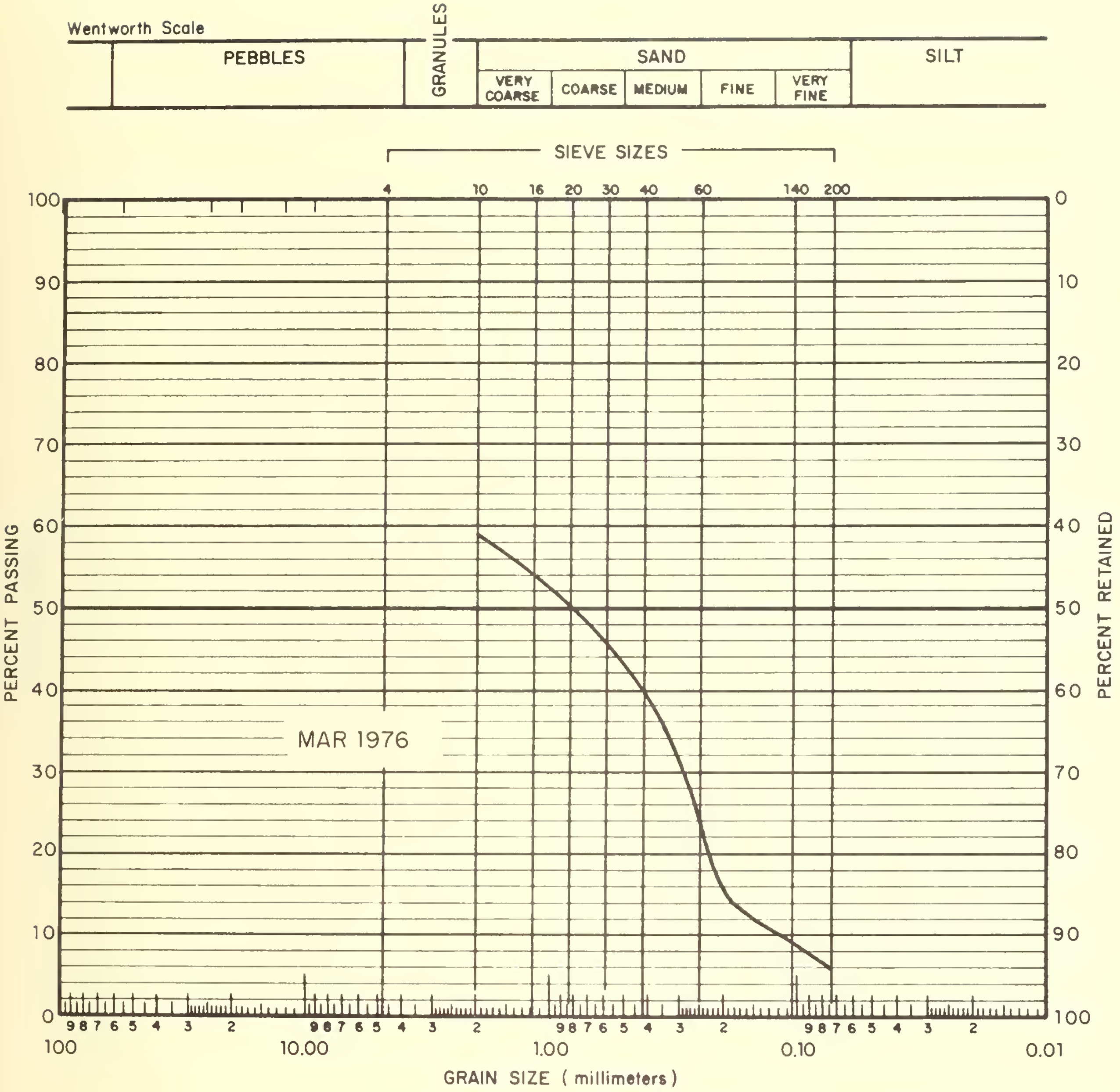

Figure B-5-8
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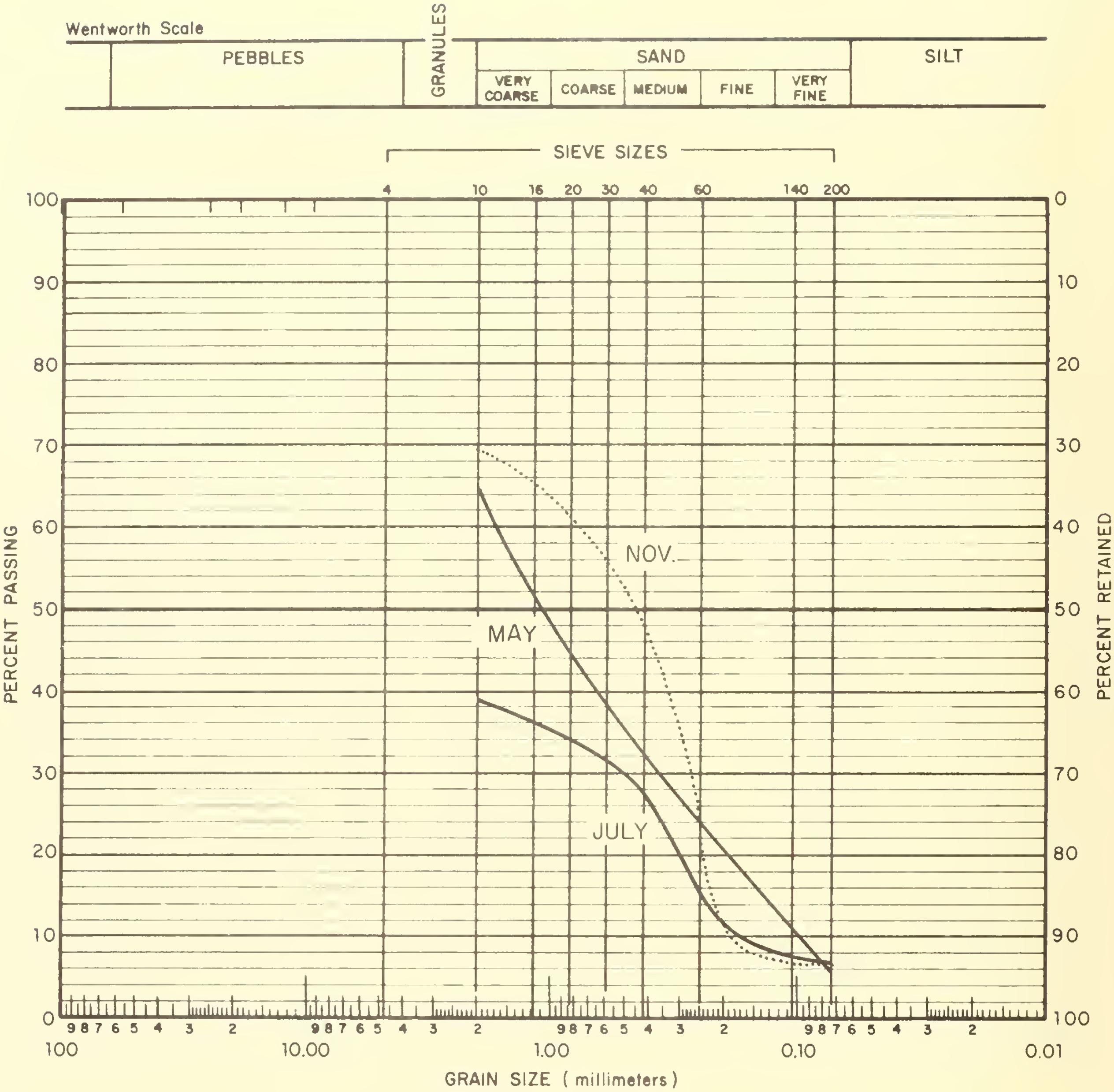

Figure B-5-9
SEDIMENT GRAIN SIZE DISTRIBUTION,
STATION W-2
MAY 1975 - MAY 1976

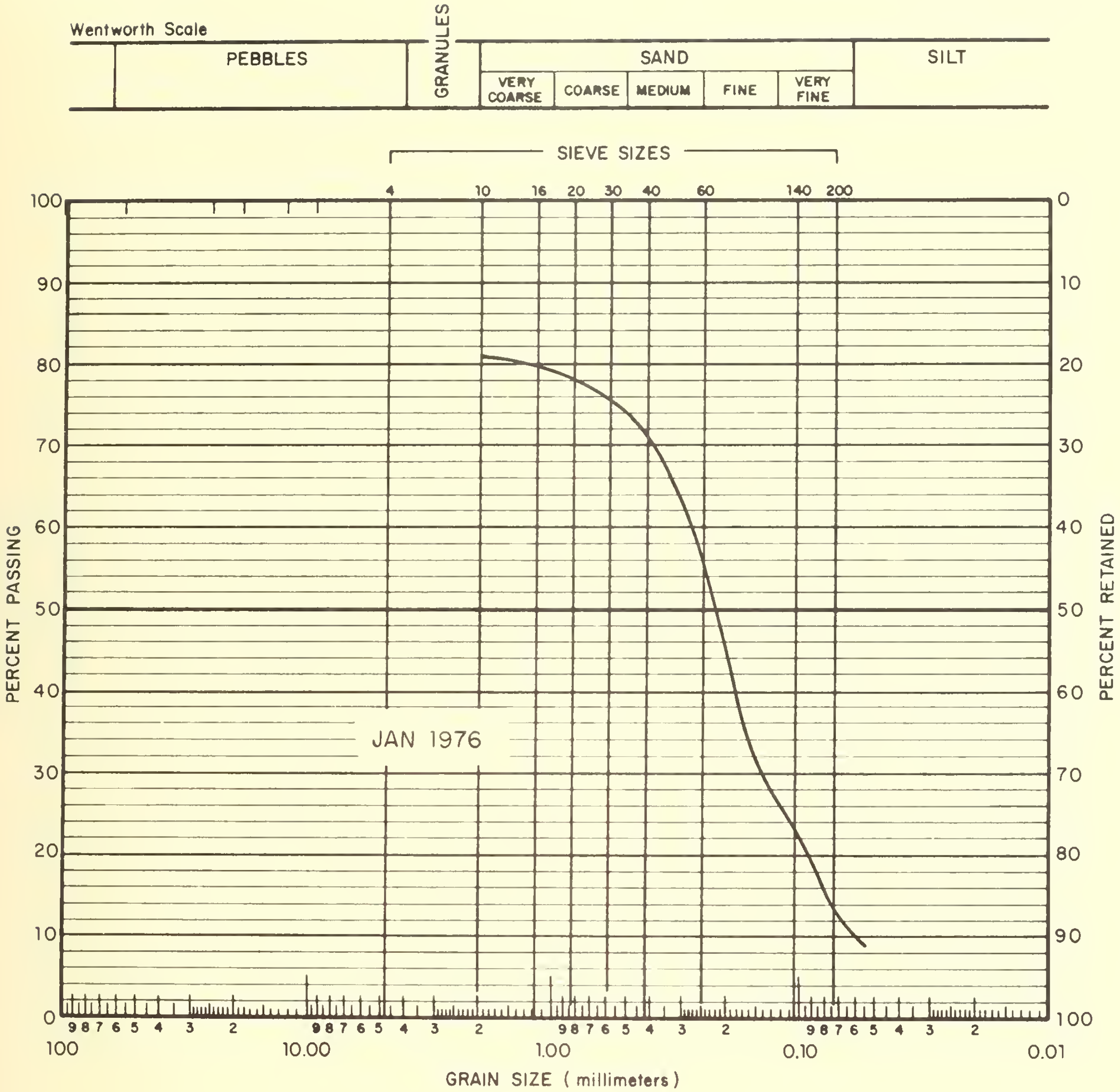

Figure B-5-9
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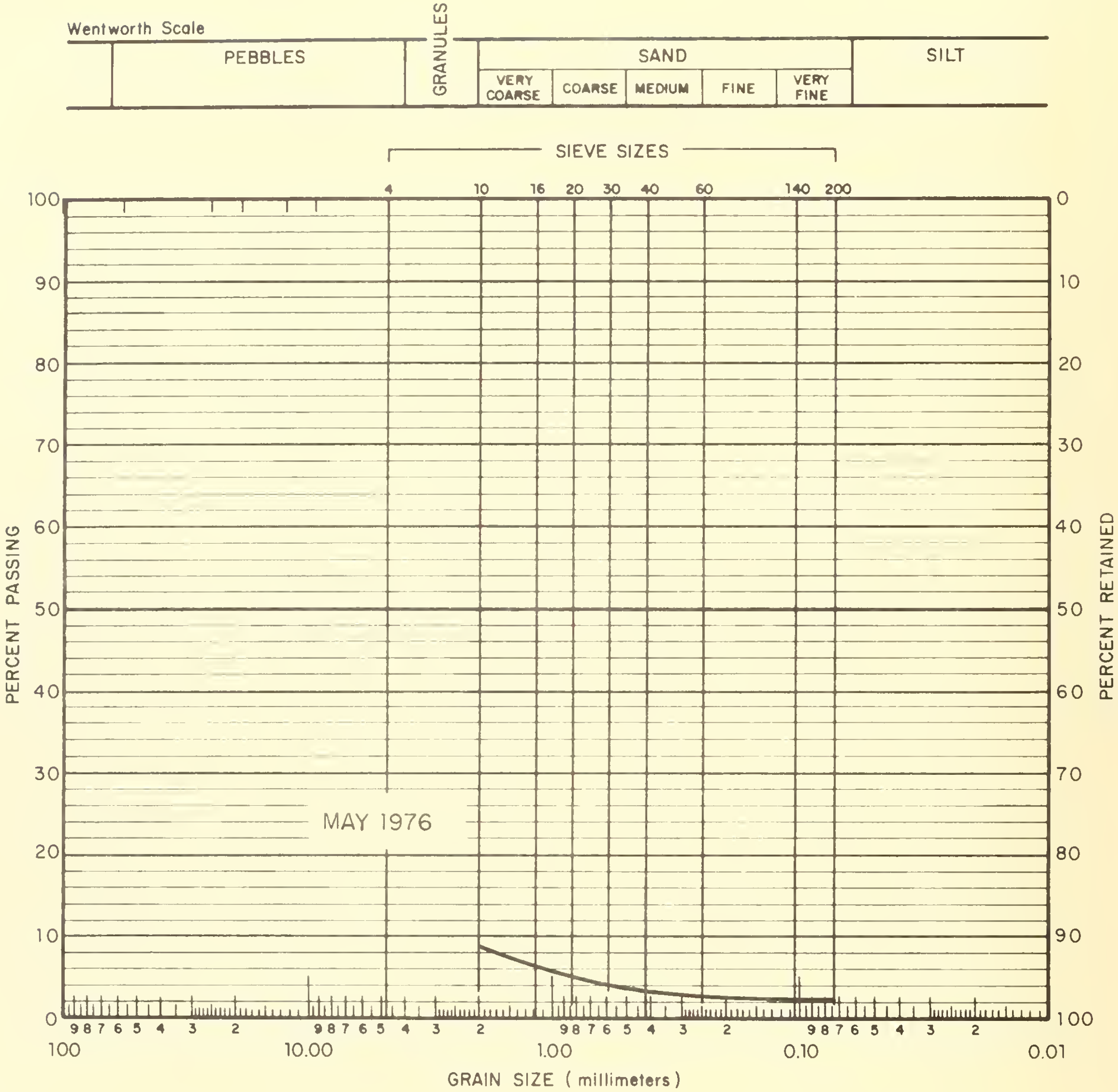

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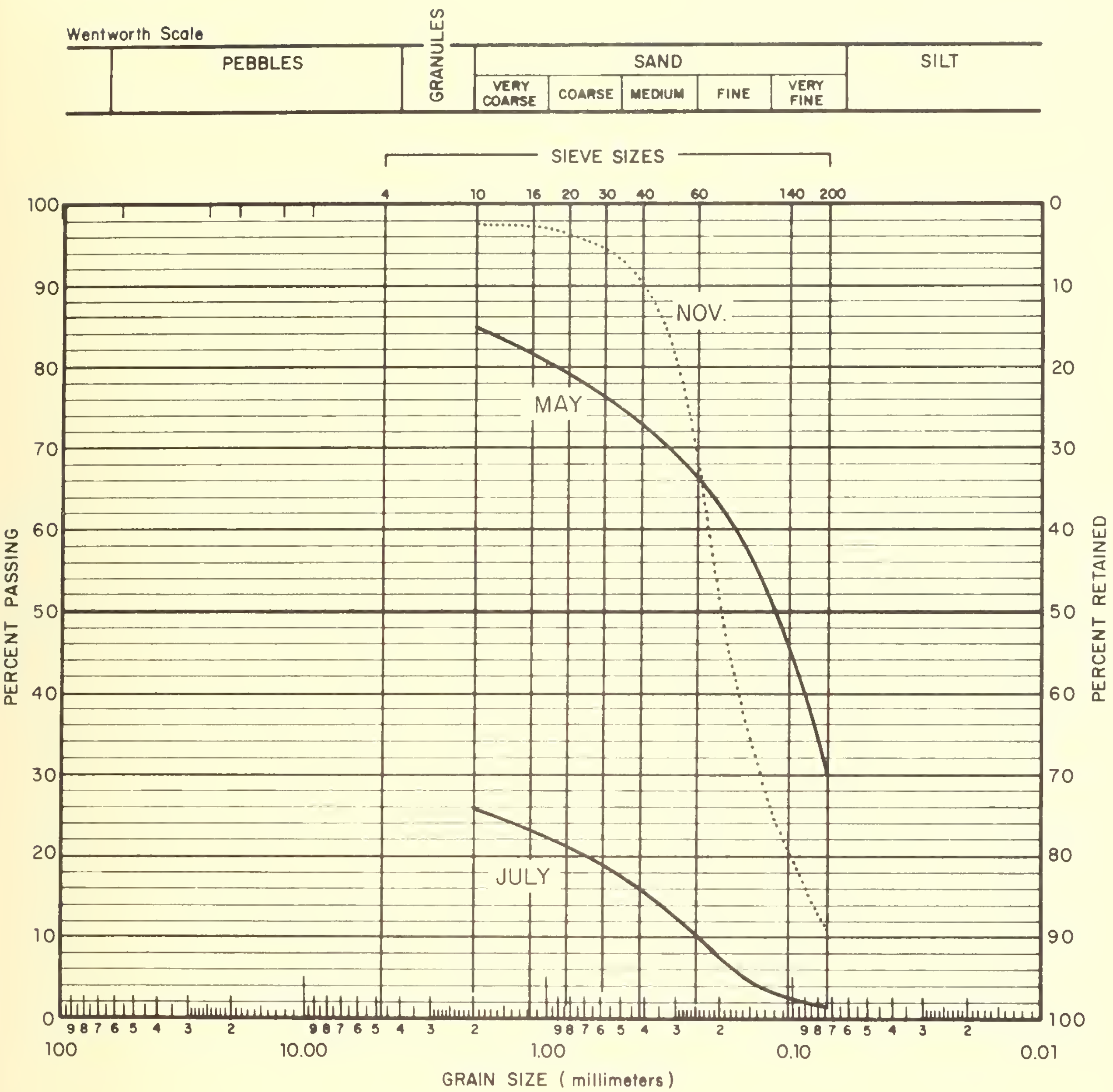


Figure B-5-10
SEDIMENT GRAIN SIZE DISTRIBUTION,
STATION W-3
MAY 1975 - MARCH 1976

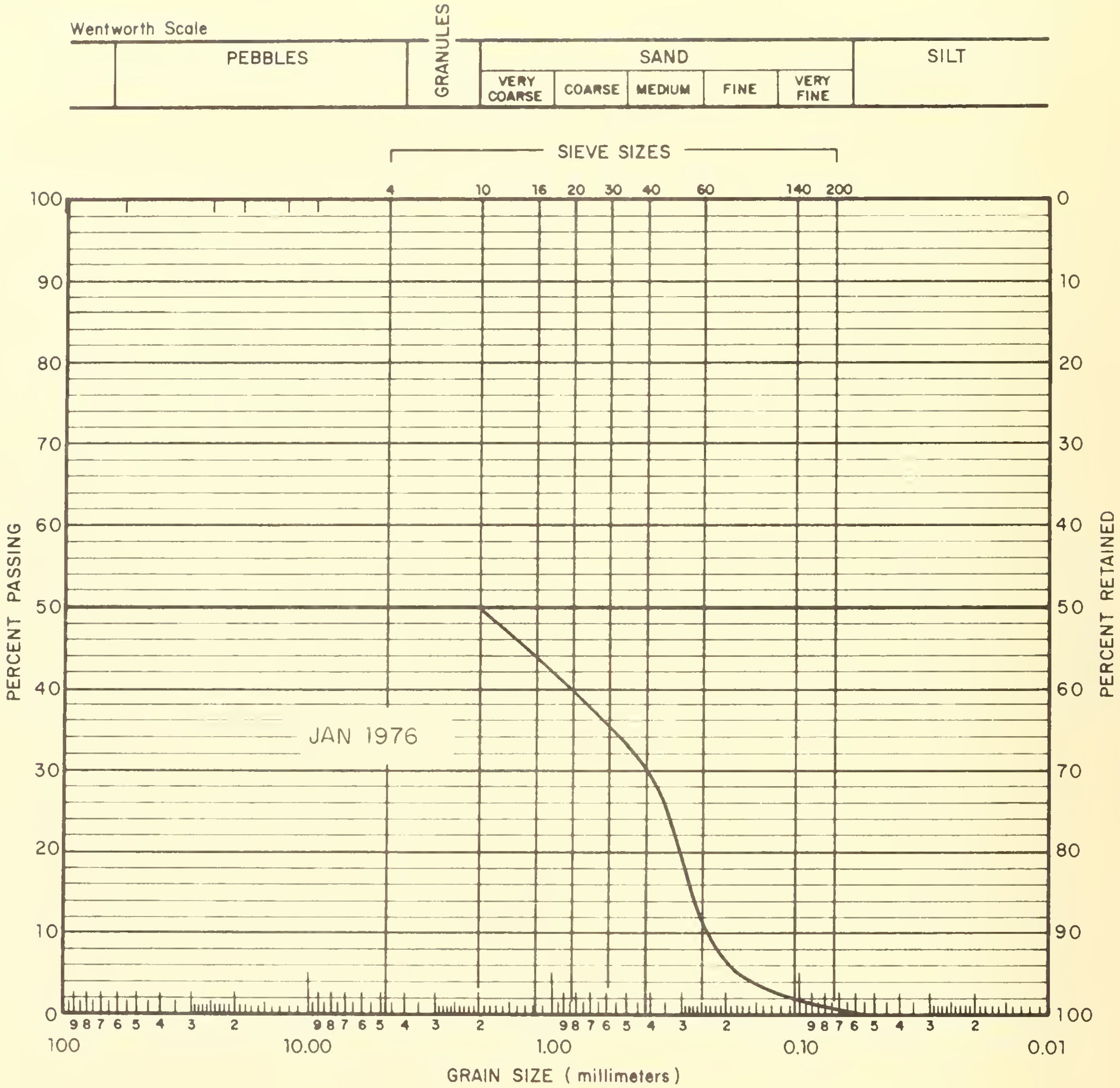


Figure B-5-10
(continued)

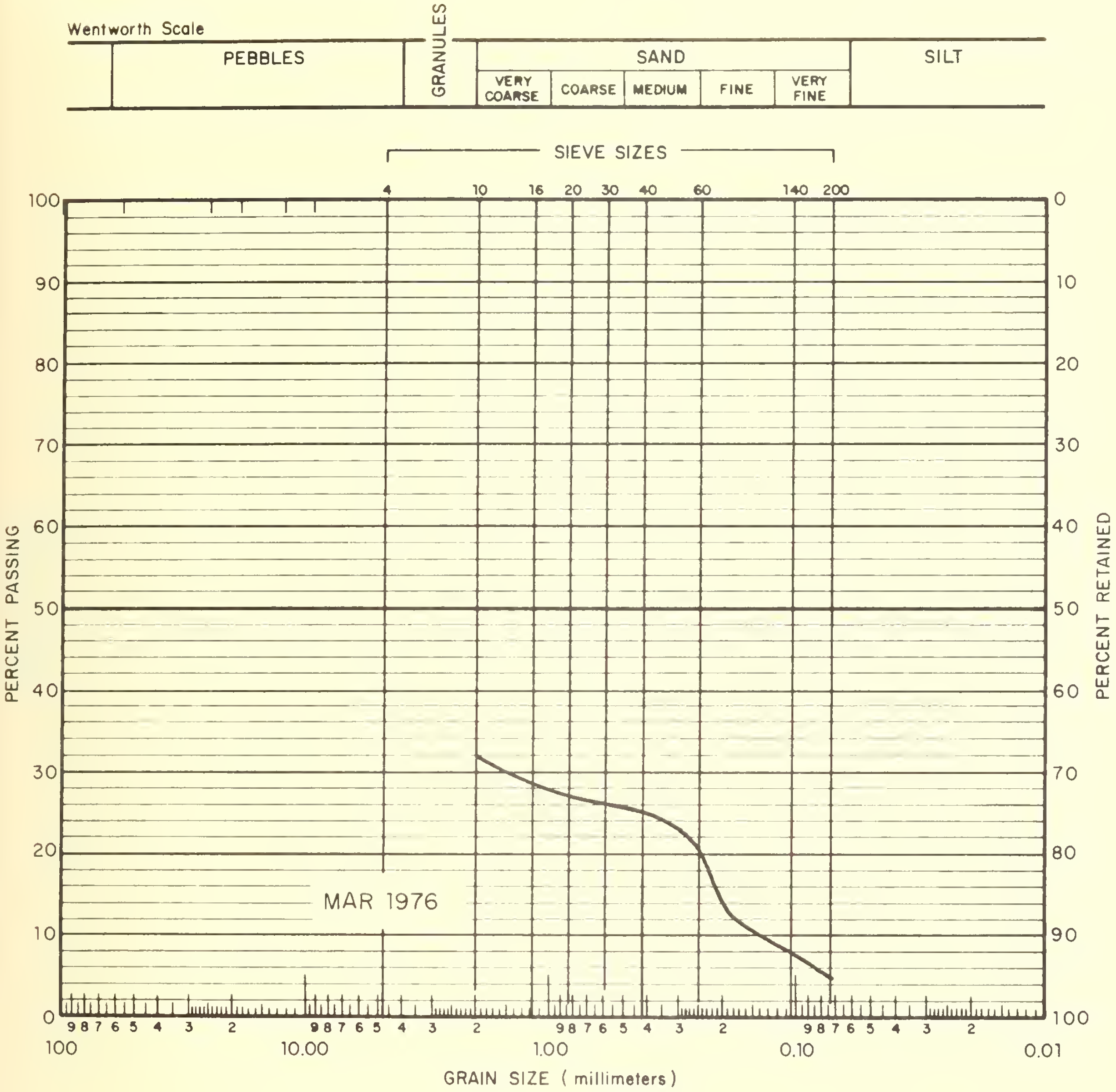


Figure B-5-10
(concluded)

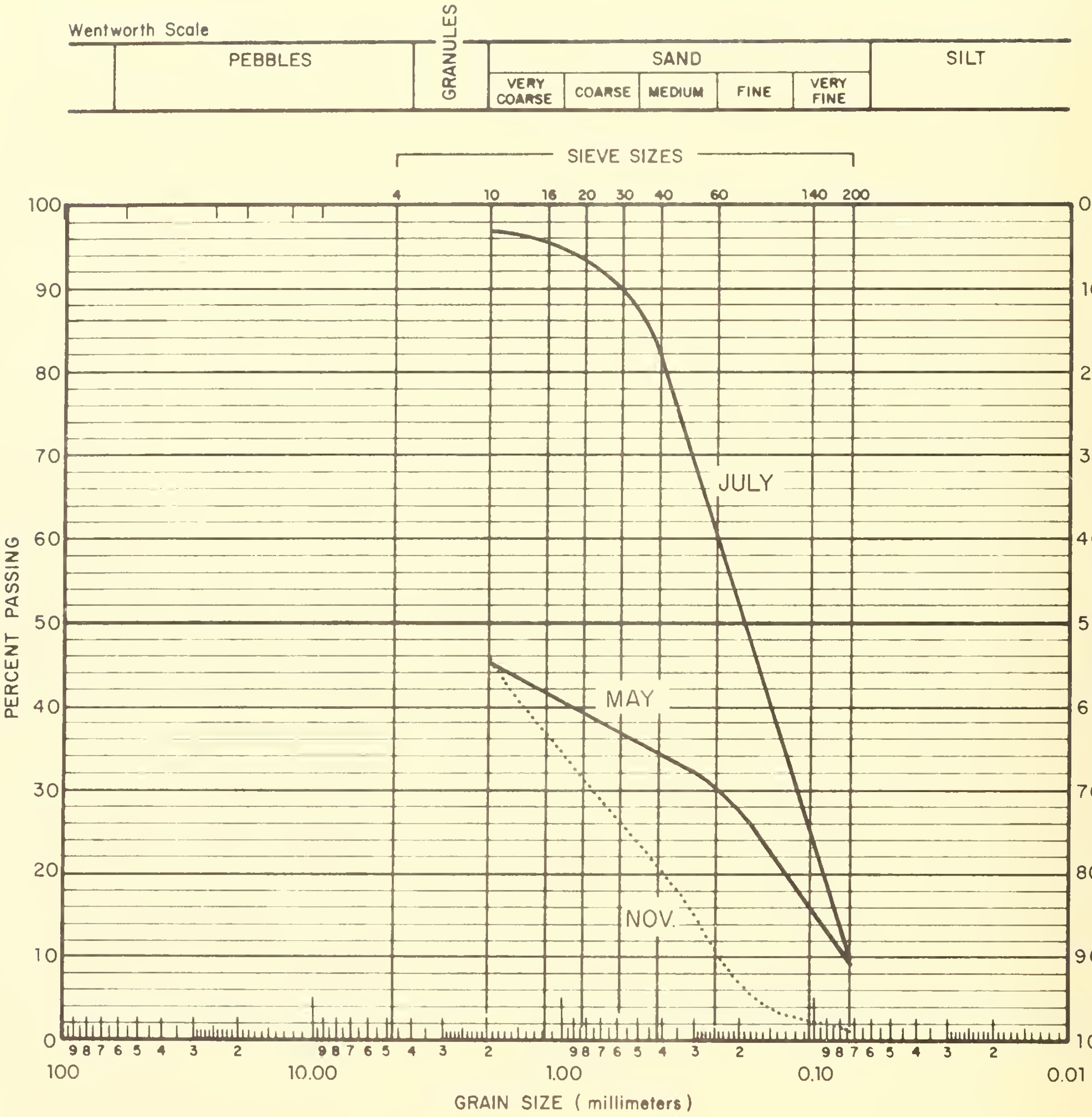


Figure B-5-11
SEDIMENT GRAIN SIZE DISTRIBUTION,
STATION, U. W. L.
MAY, JULY, NOVEMBER, 1975

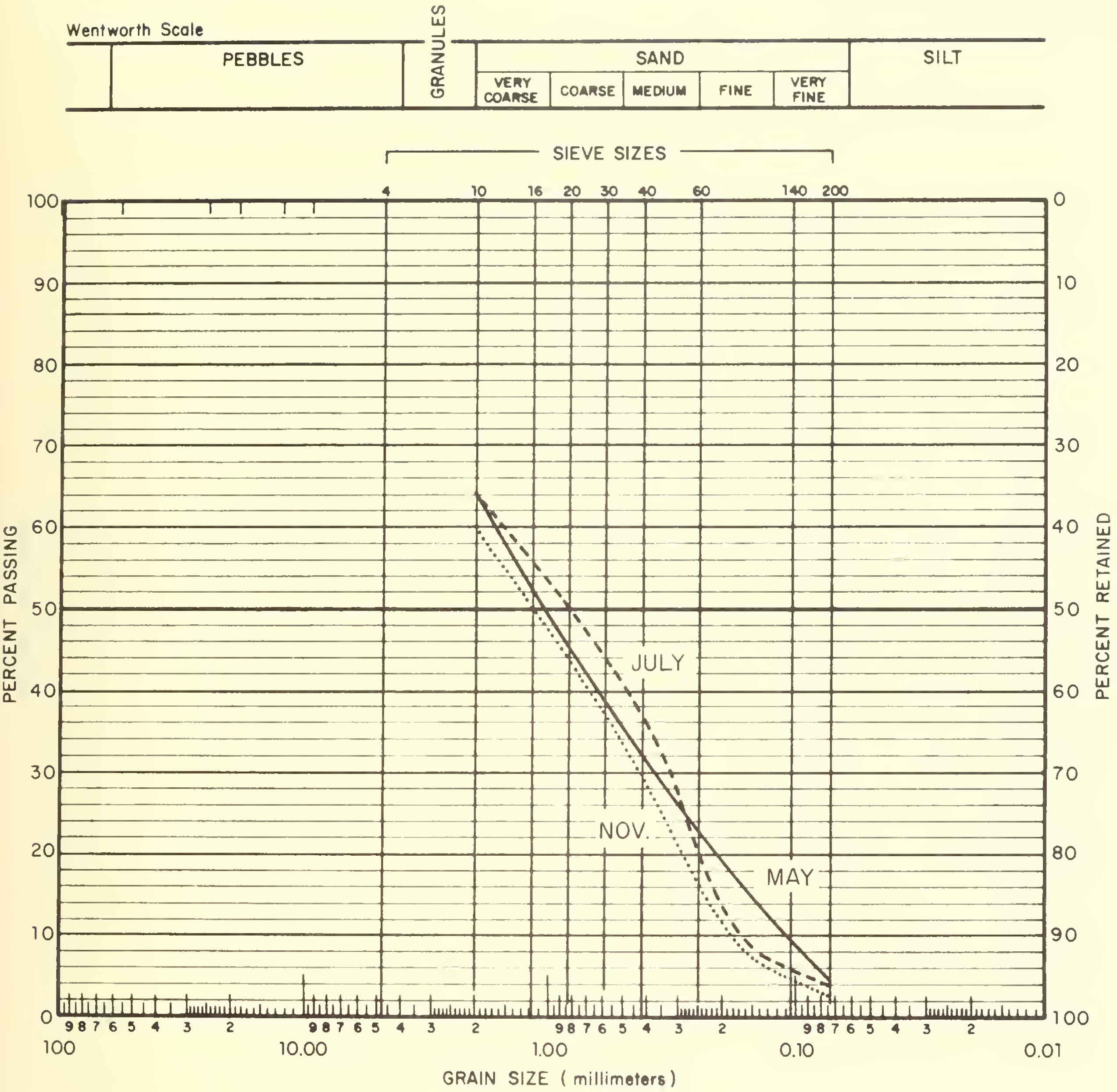


Figure B-5-12
SEDIMENT GRAIN SIZE DISTRIBUTION,
STATION L. W. L.
MAY, JULY, NOVEMBER 1975

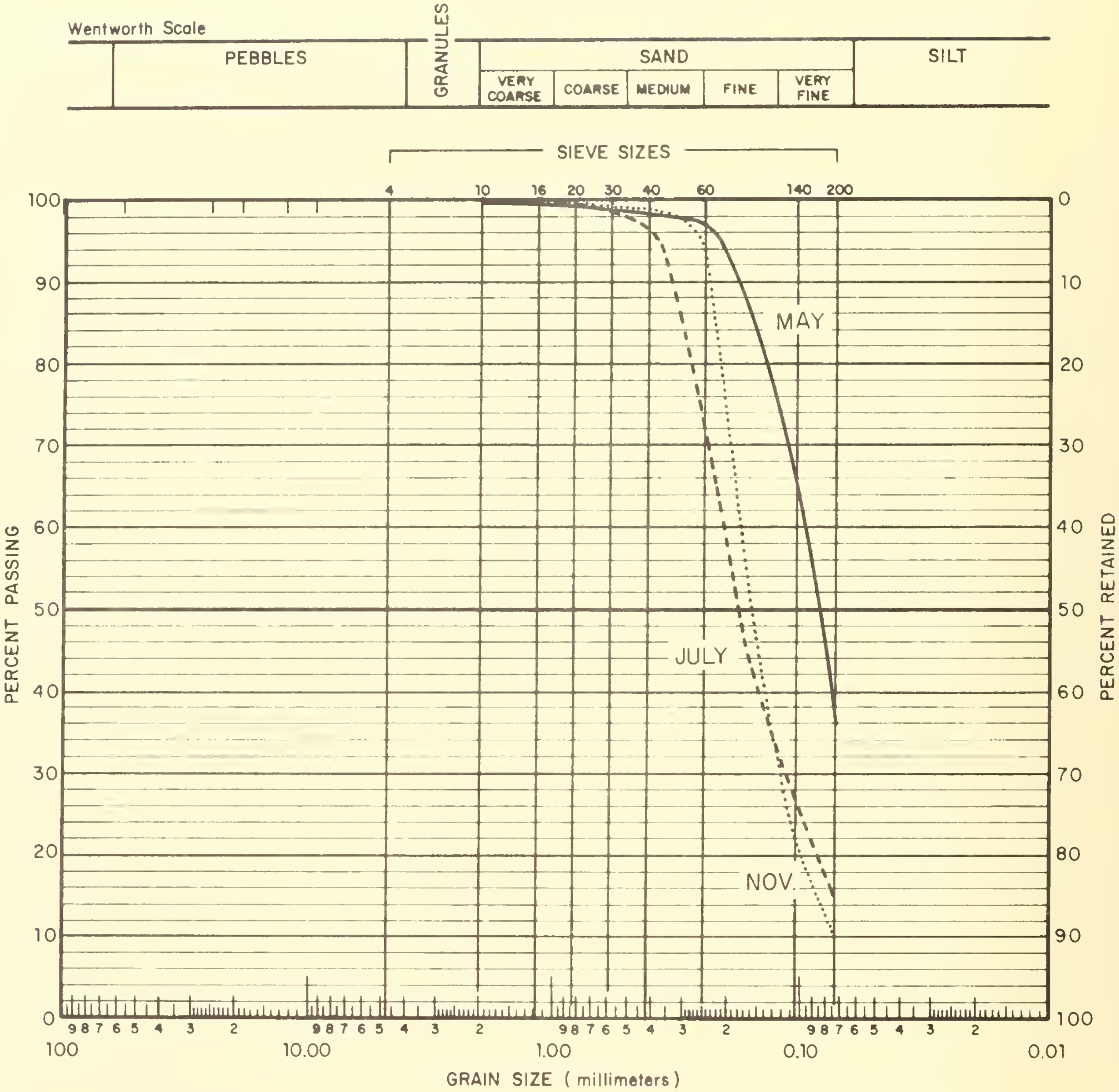


Figure B-5-13
SEDIMENT GRAIN SIZE DISTRIBUTION,
STATION WR-1,
MAY 1975 - MARCH 1976

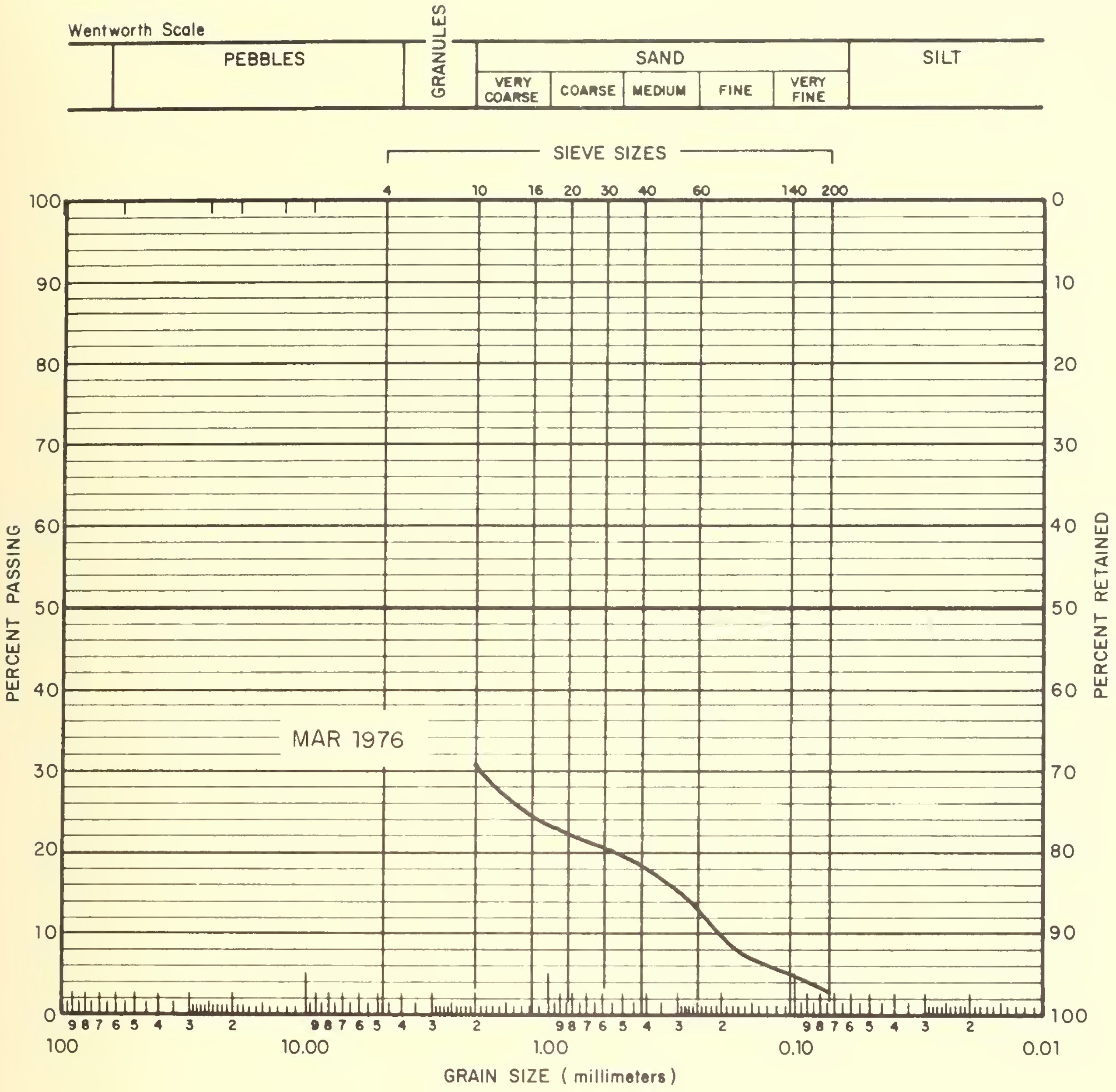


Figure B-5-13
(continued)

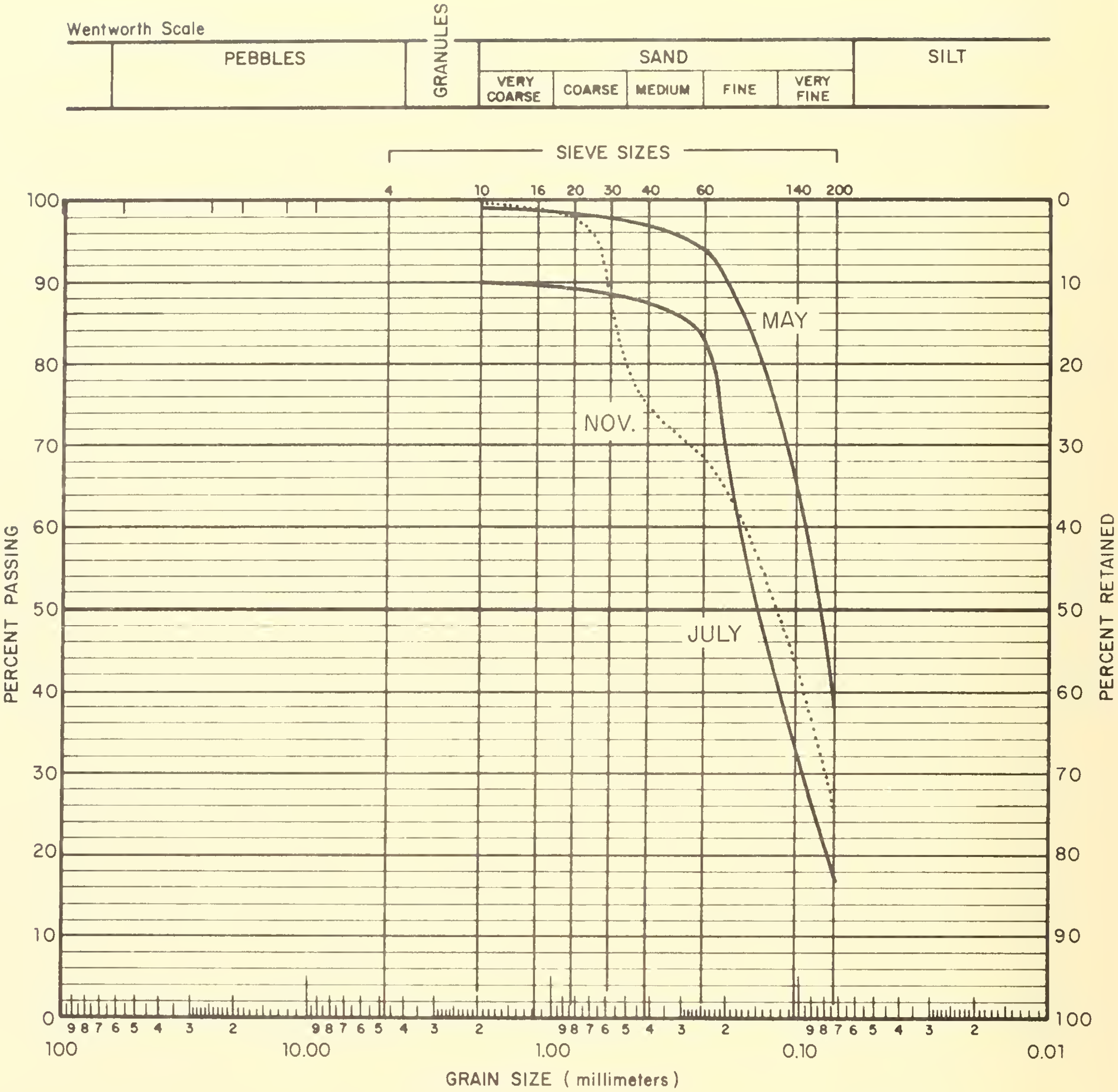


Figure B-5-14
SEDIMENT GRAIN SIZE DISTRIBUTION,
STATION WR-2
MAY 1975 - JULY 1976

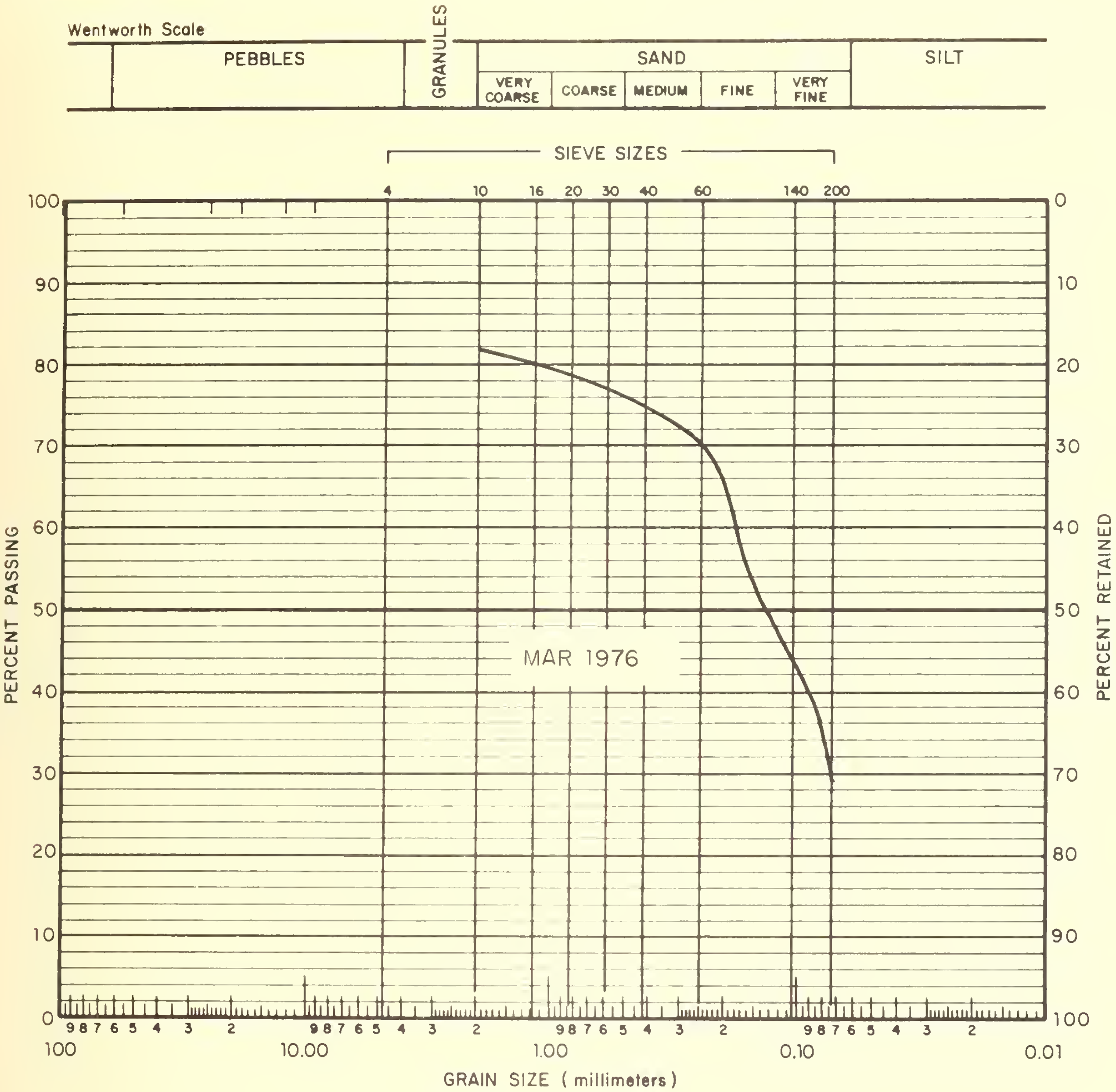


Figure B-5-14
(continued)

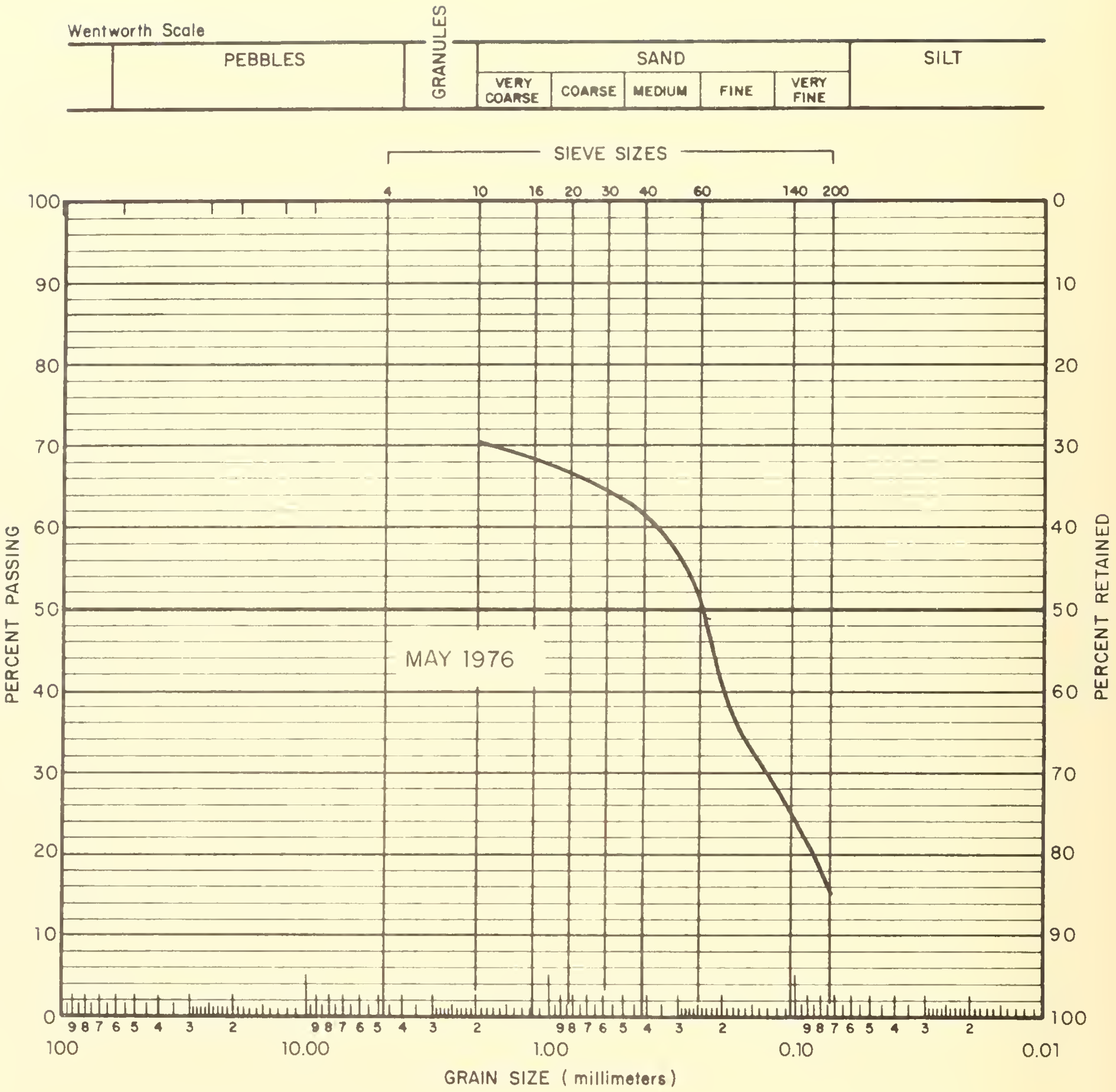


Figure B-5-14
(Continued)

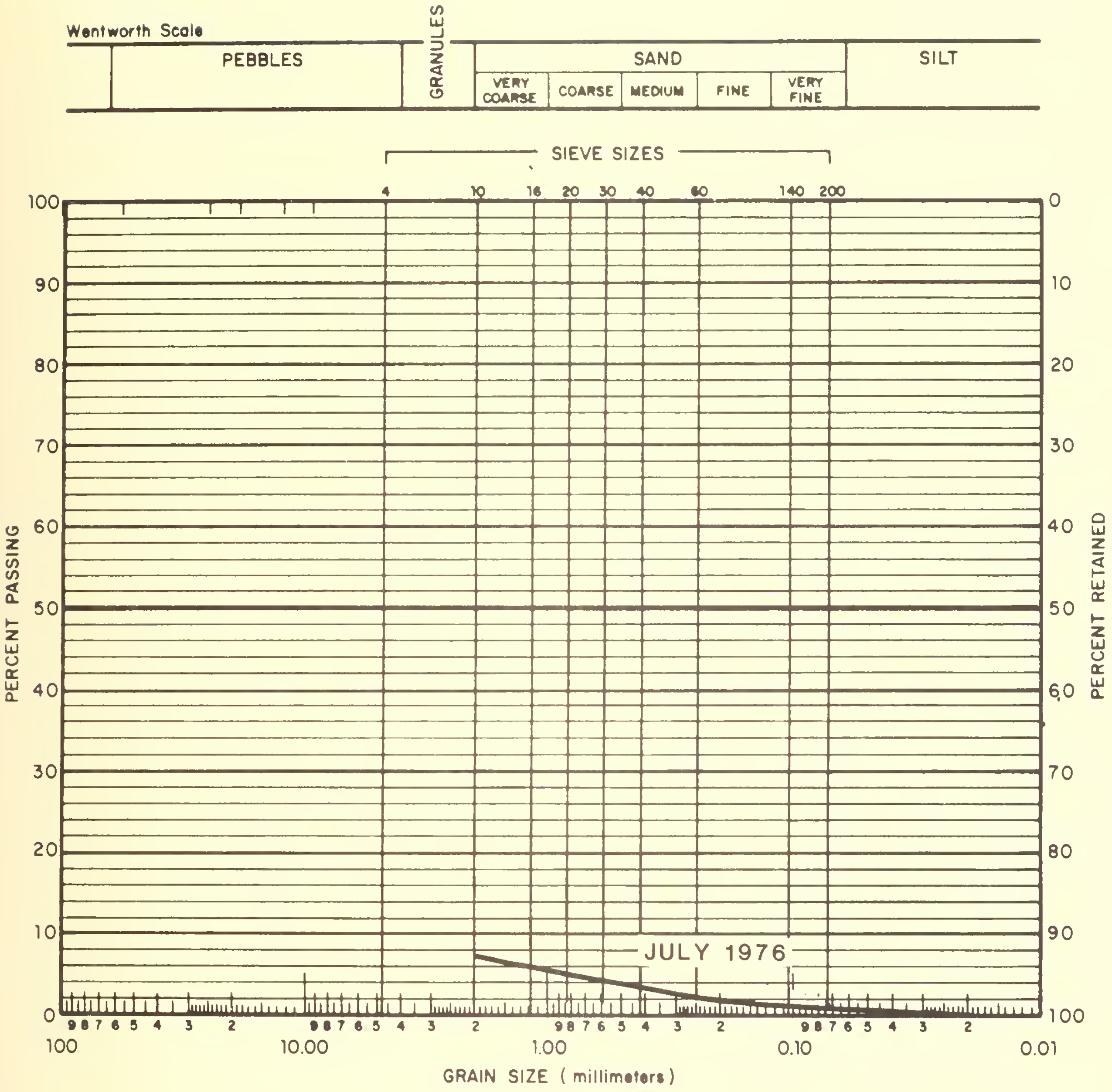


Figure B-5-14
(concluded)

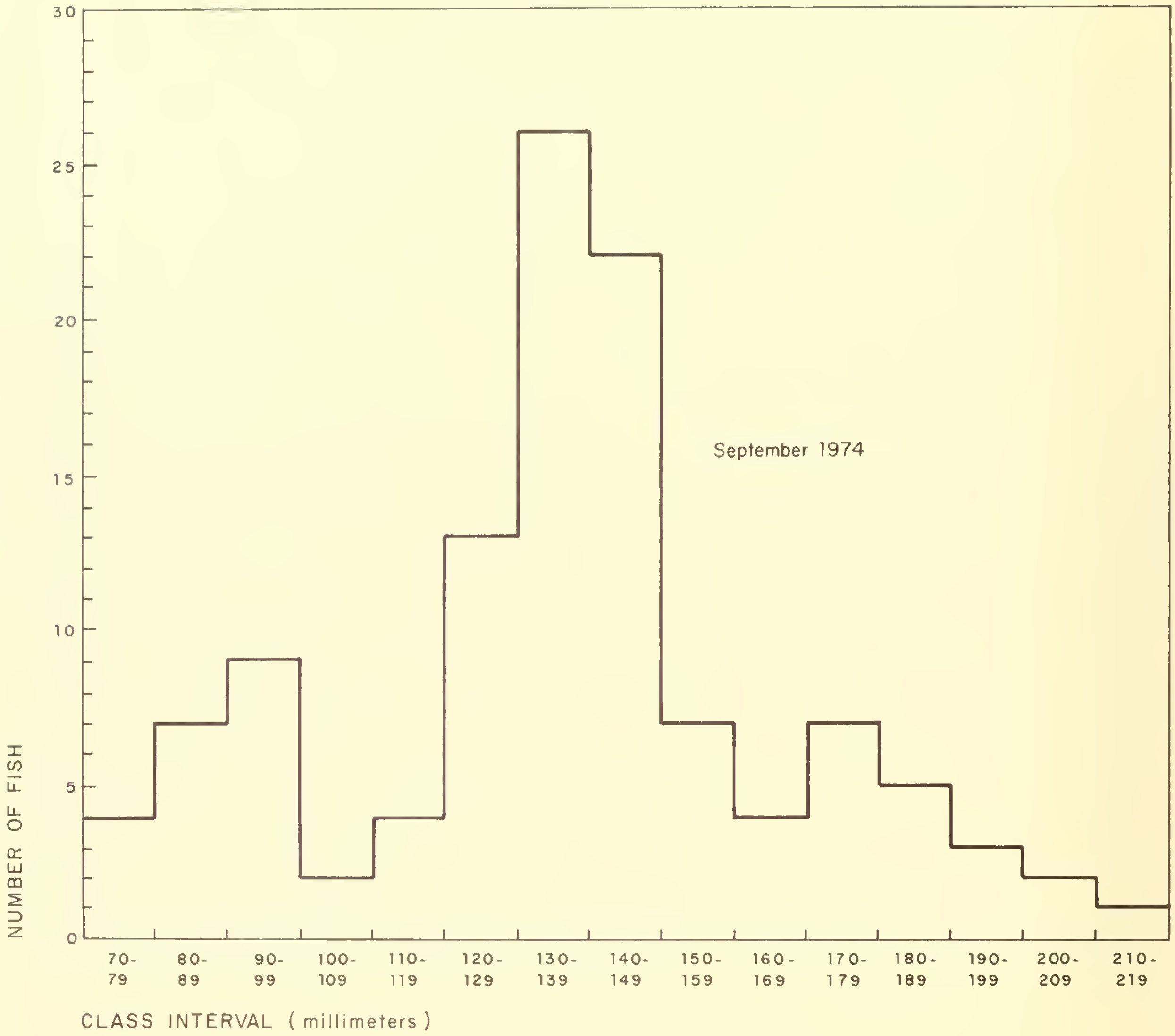


Figure B-5-15
LENGTH-FREQUENCY DISTRIBUTION OF MOUNTAIN SUCKERS
CAPTURED IN PICEANCE BASIN.

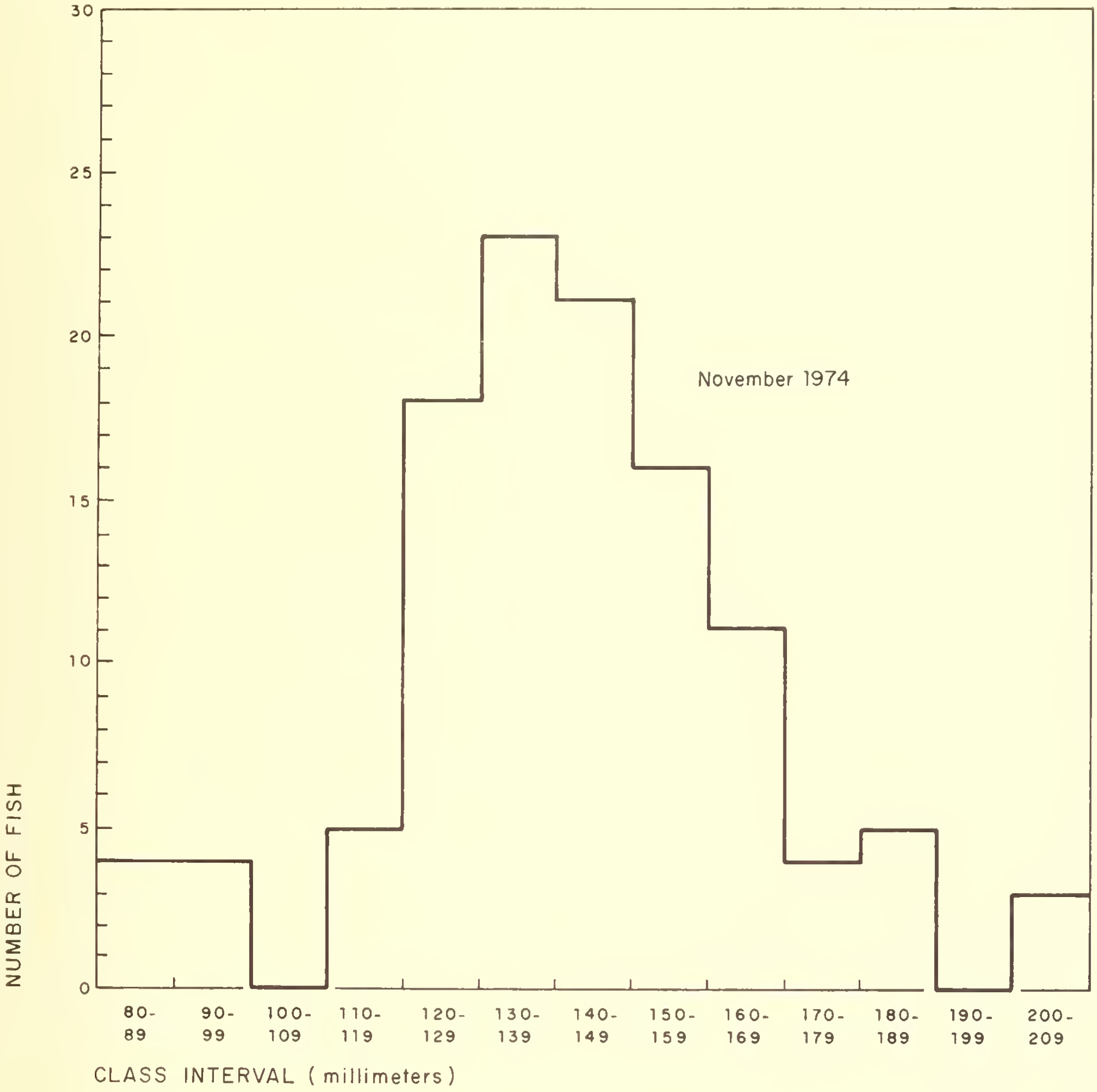


Figure B-5-15
(continued)

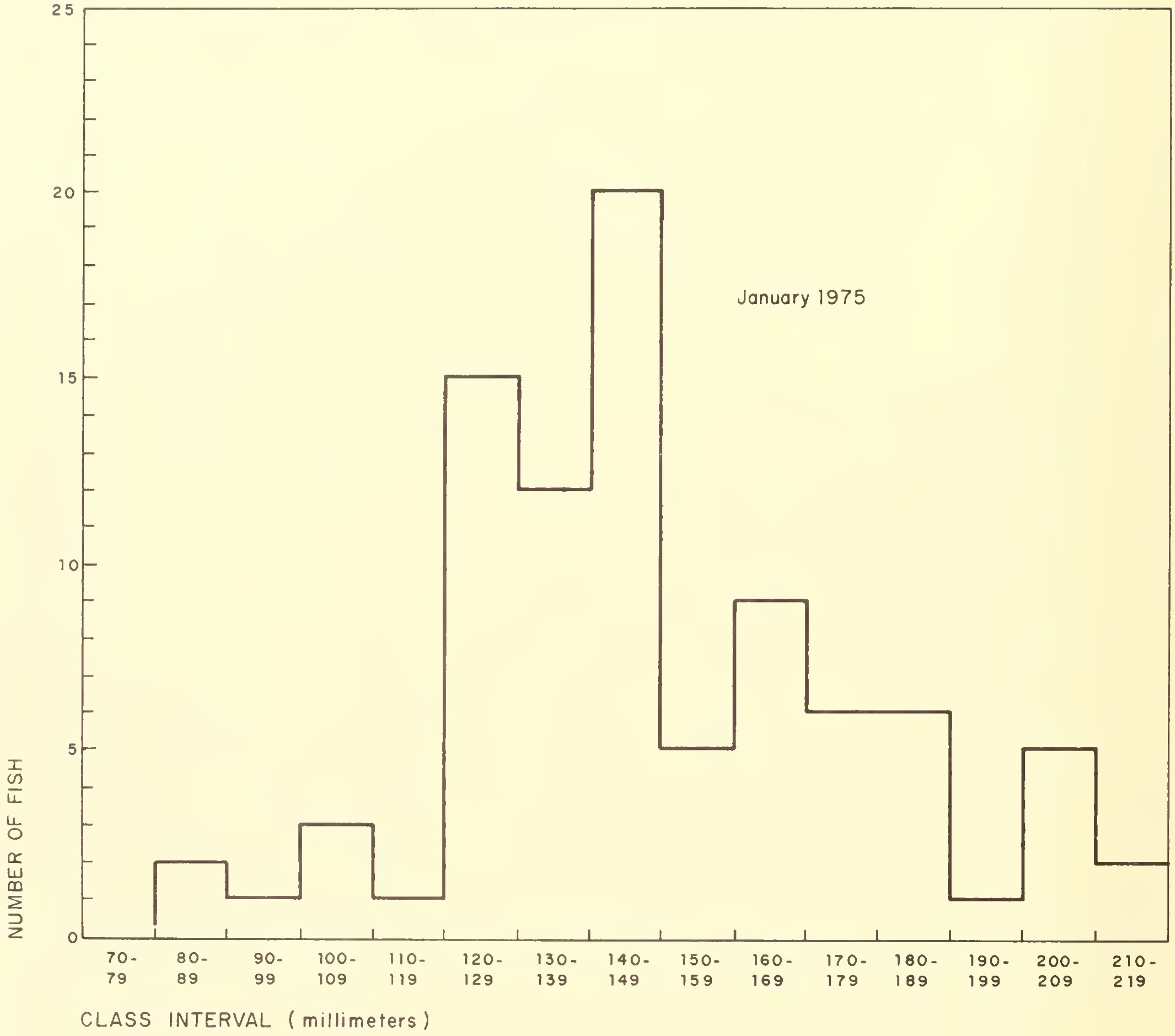


Figure B-5-15
(continued)

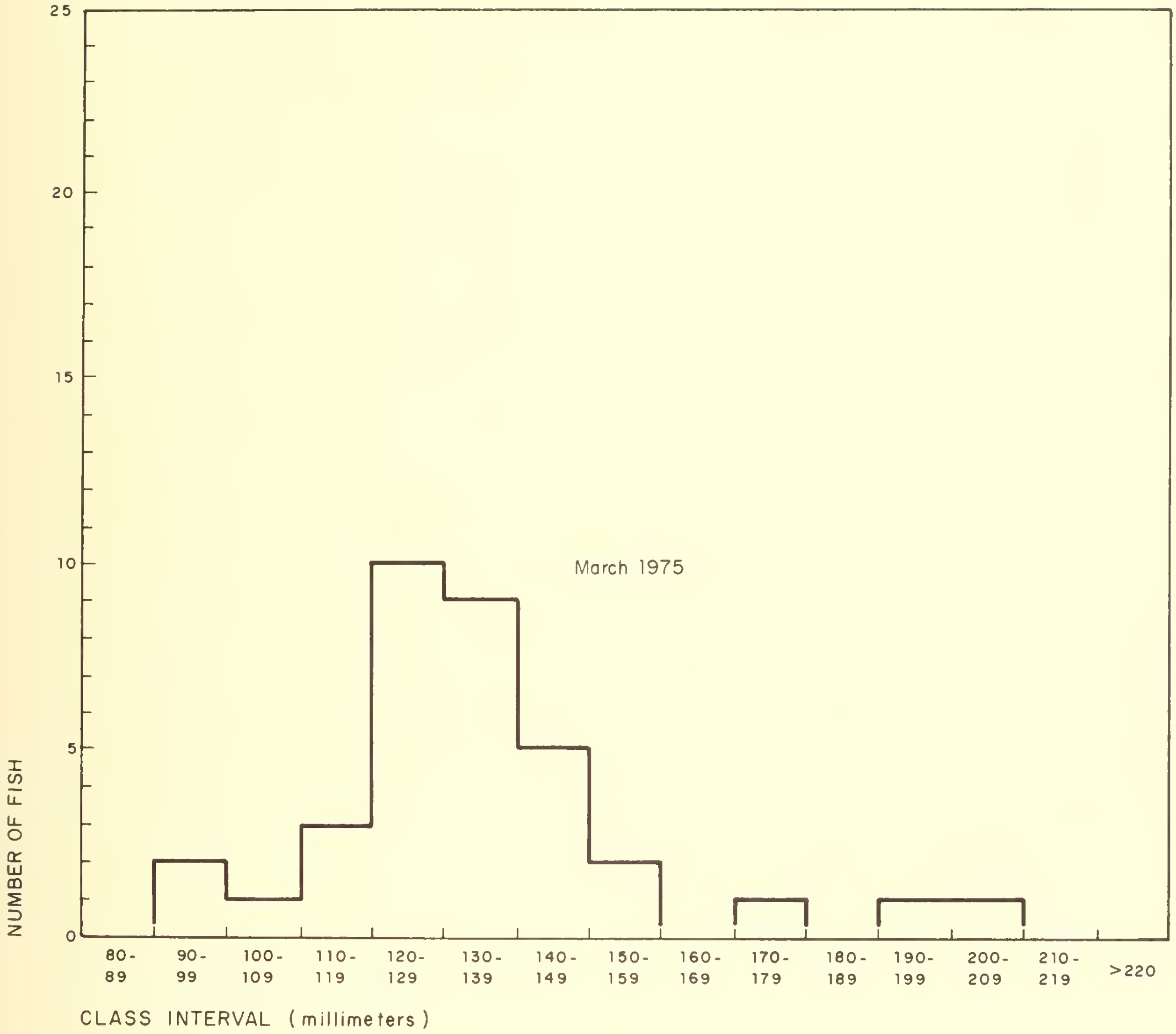


Figure B-5-15
(continued)

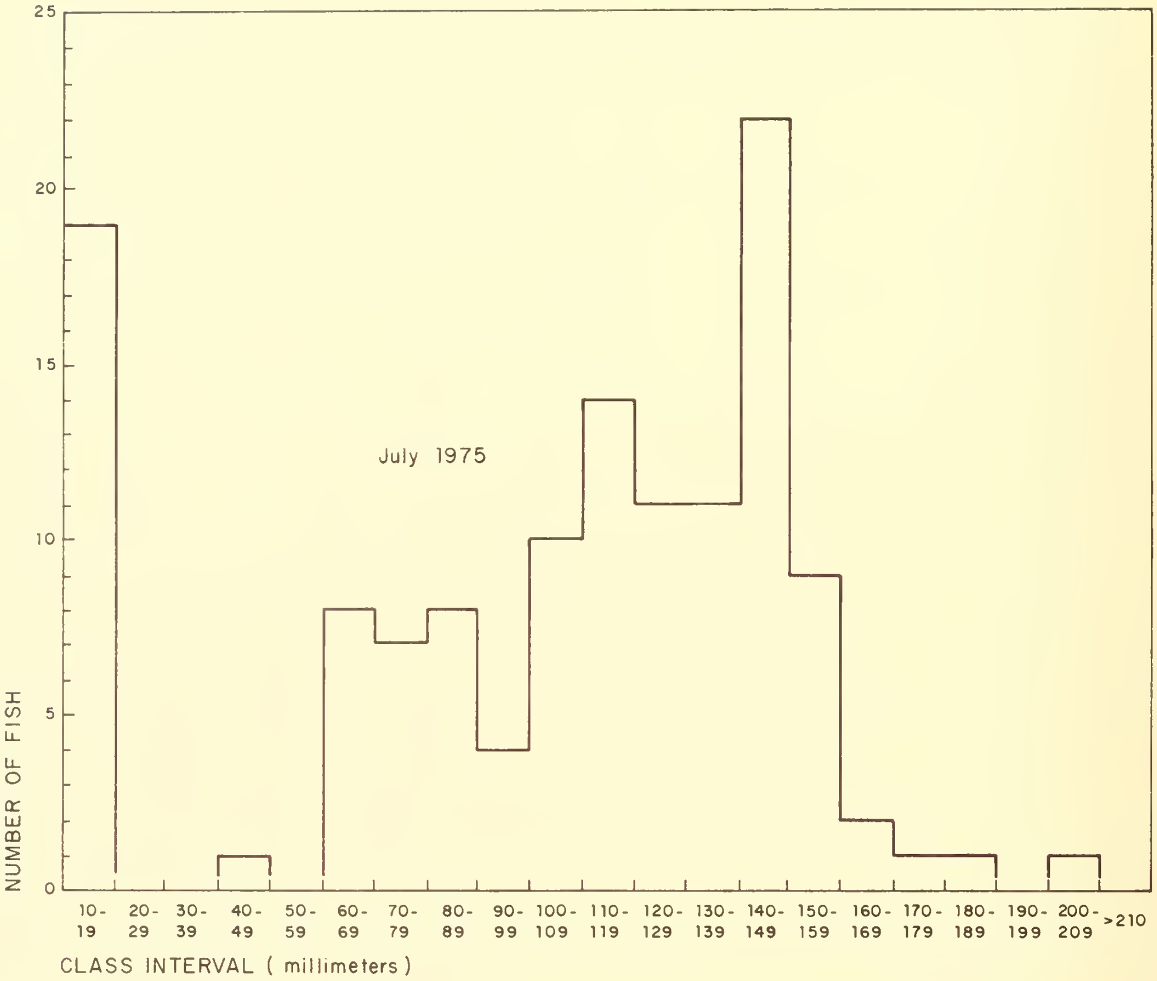


Figure B-5-15 (continued)

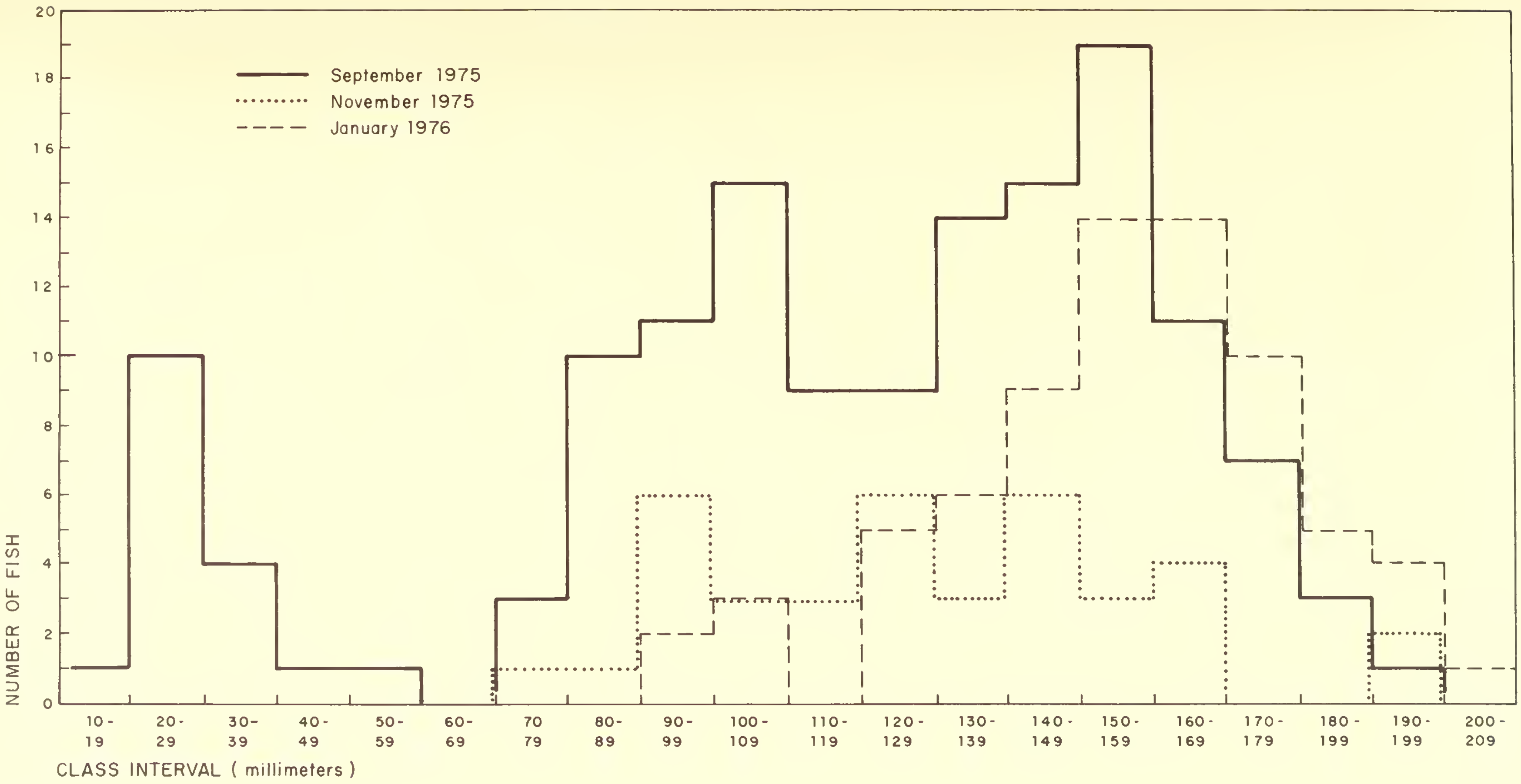


Figure B-5-15
(continued)

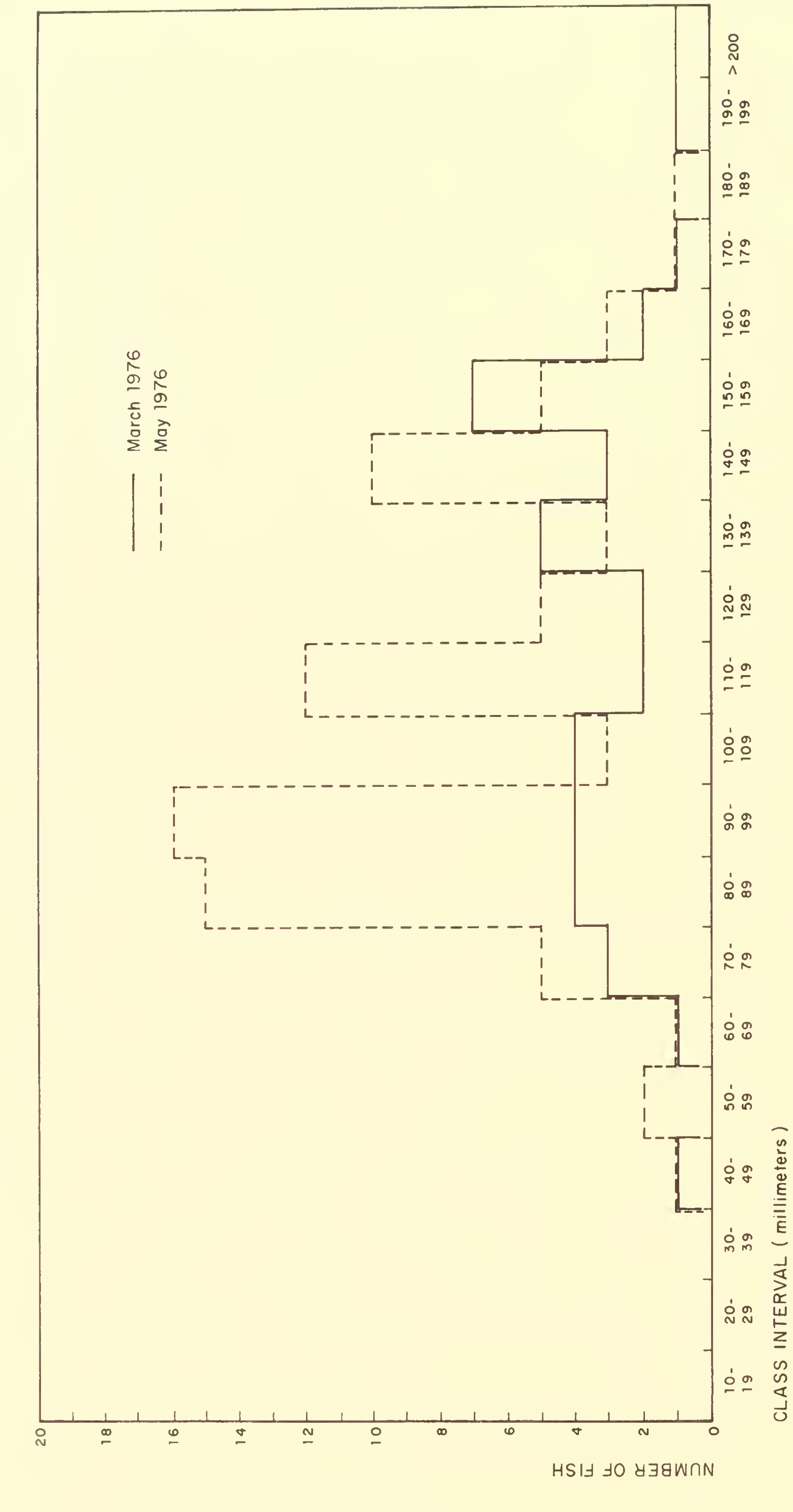


Figure B-5-15
(concluded)

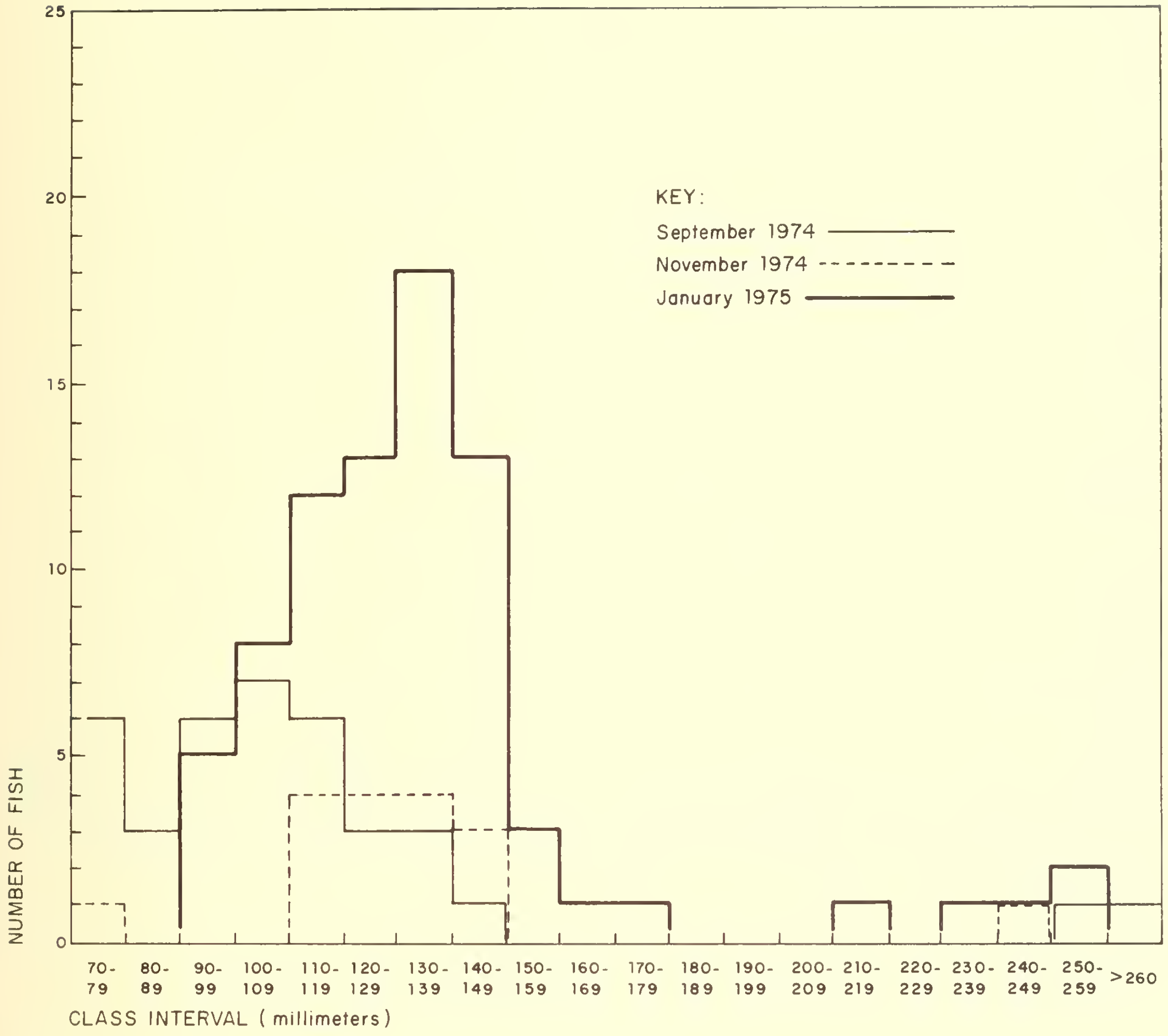


Figure B-5-16
LENGTH-FREQUENCY DISTRIBUTION OF BROOK TROUT CAPTURED IN THE
PICEANCE BASIN OVER THREE SAMPLING PERIODS:
SEPTEMBER AND NOVEMBER 1974 AND JANUARY 1975.

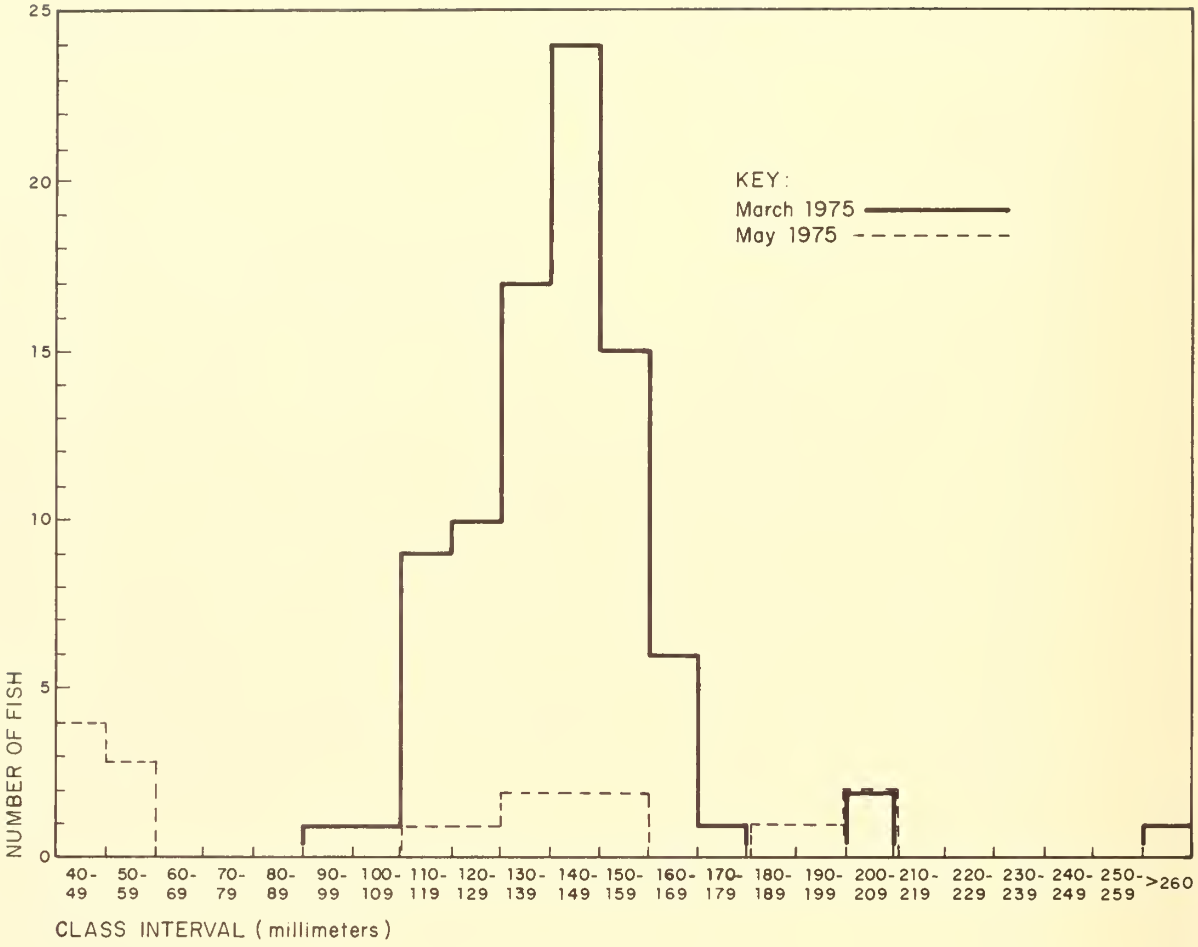


Figure B-5-17
LENGTH-FREQUENCY DISTRIBUTION OF BROOK TROUT CAPTURED IN PICEANCE BASIN OVER TWO SAMPLING PERIODS, MARCH AND MAY, 1975

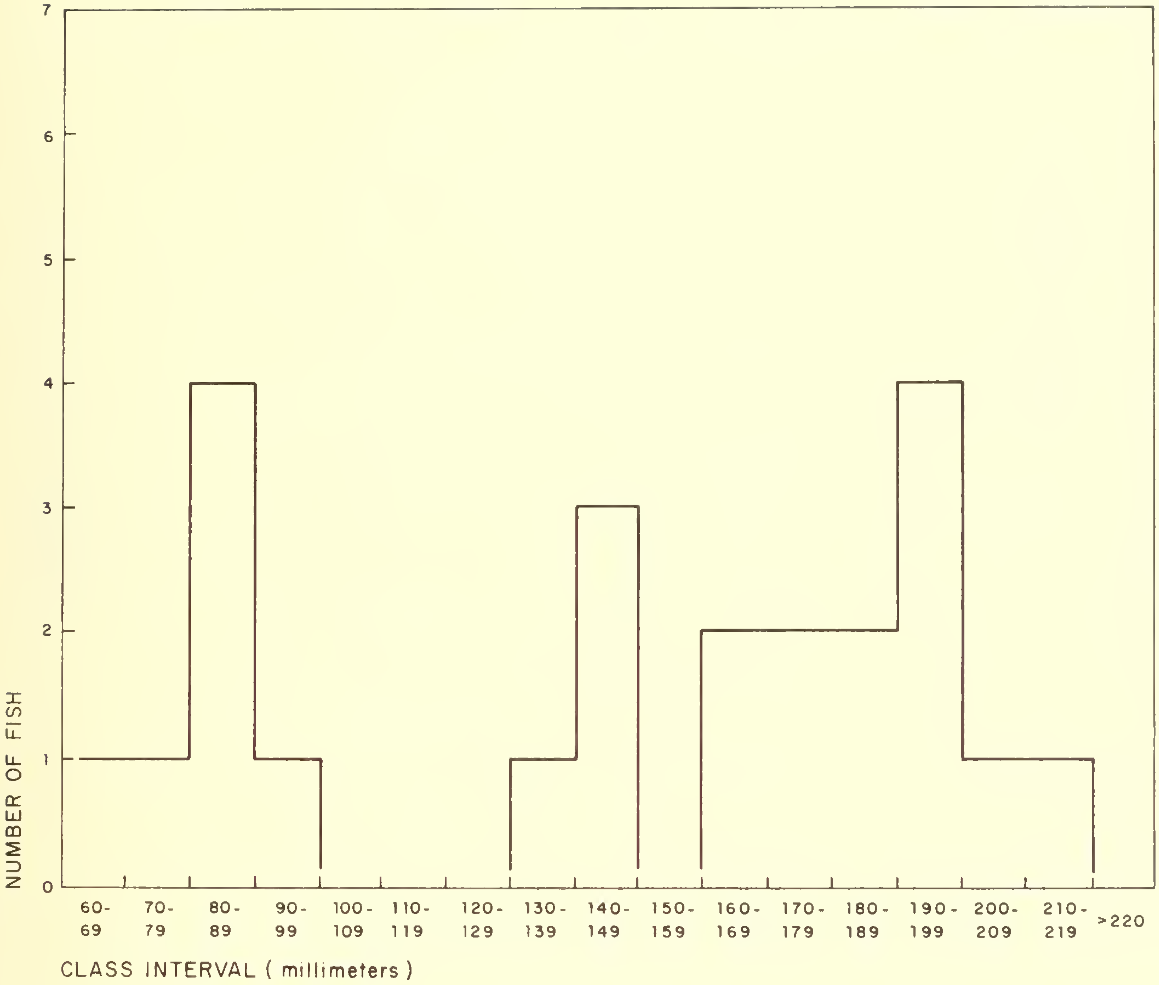


Figure B-5-18
LENGTH-FREQUENCY DISTRIBUTION OF BROOK TROUT
CAPTURED IN PICEANCE BASIN IN JULY 1975

PERCENT PASSING

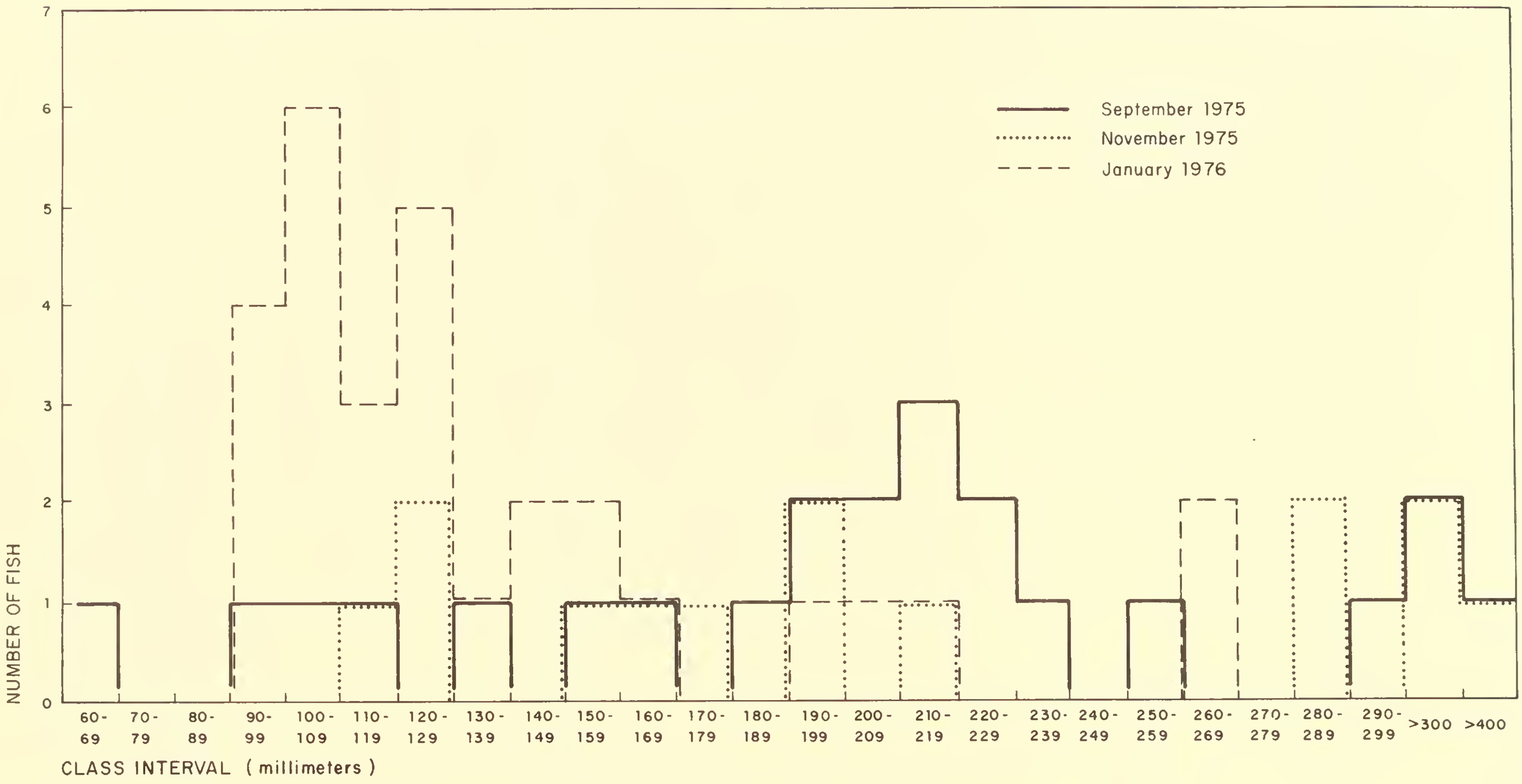


Figure B-5-19
LENGTH-FREQUENCY DISTRIBUTION OF BROOK TROUT
CAPTURED IN PICEANCE BASIN.

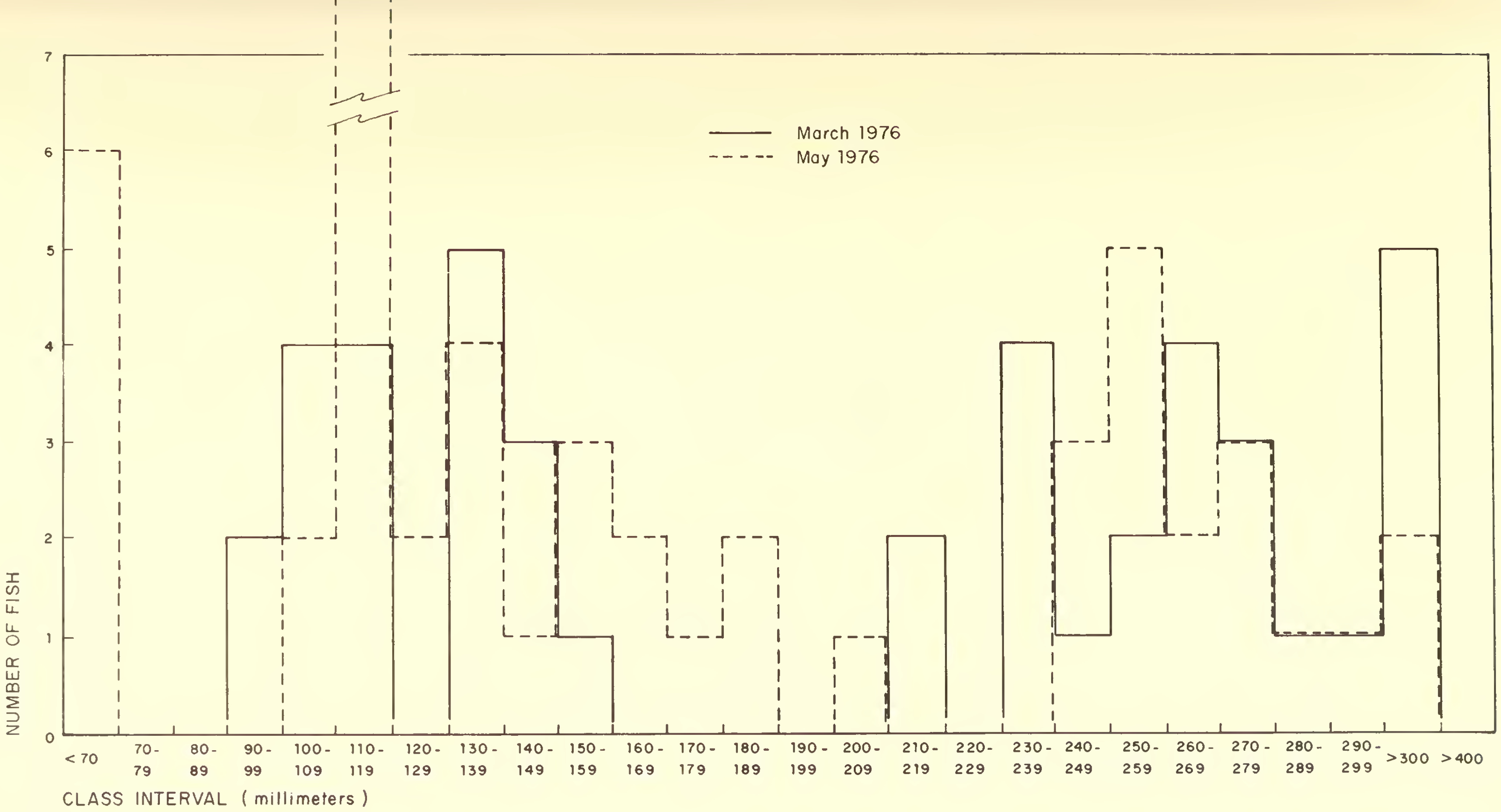
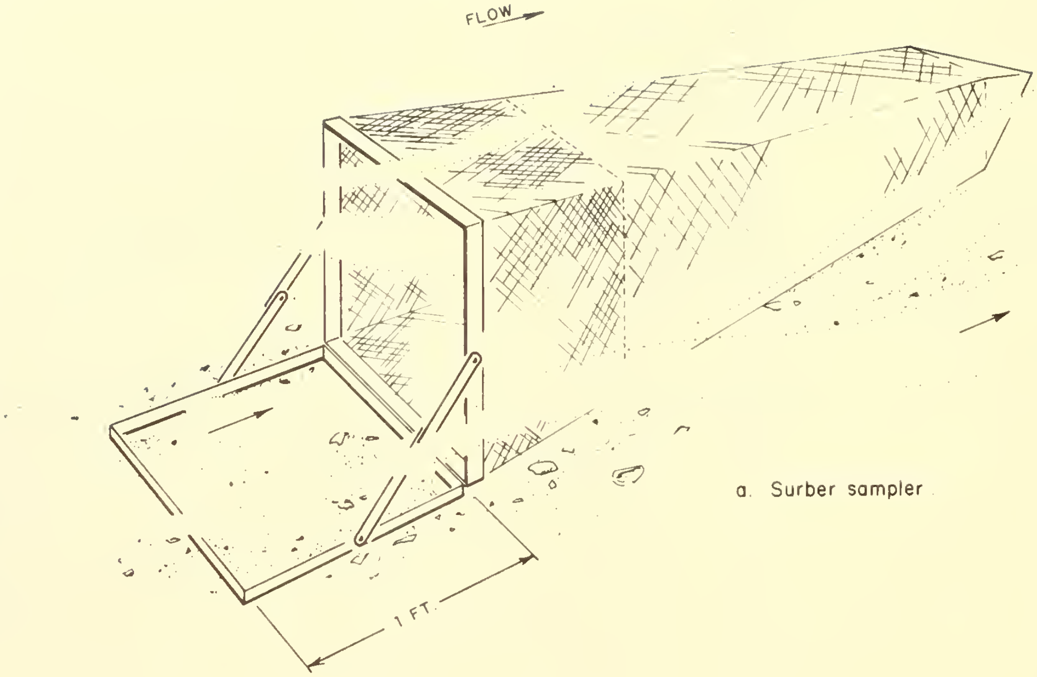
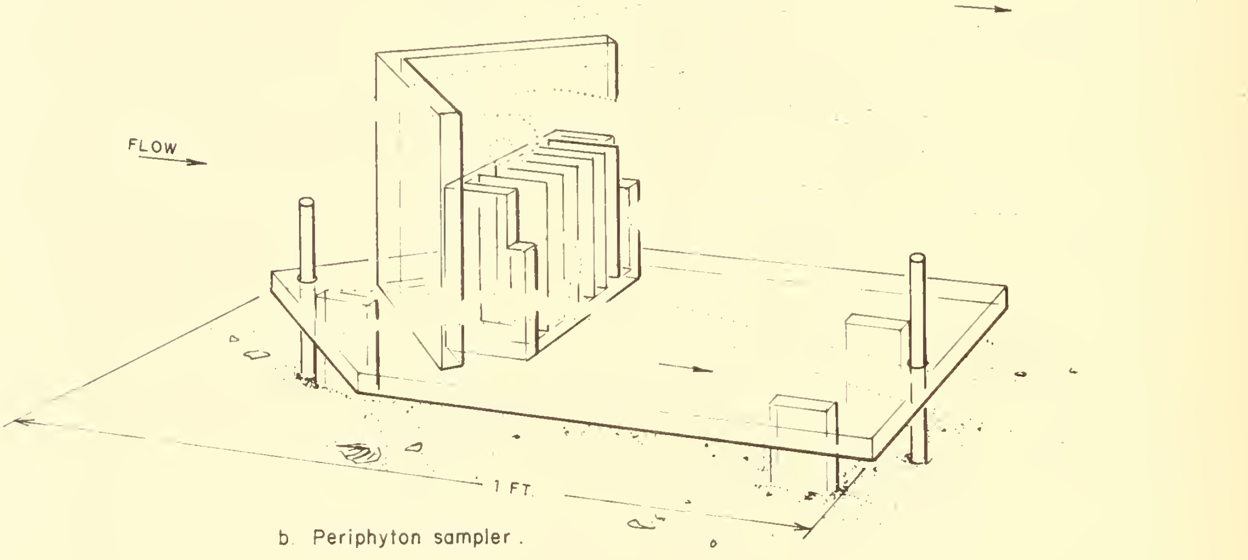


Figure B-5-20
LENGTH-FREQUENCY DISTRIBUTION OF BROOK TROUT
CAPTURED IN PICEANCE BASIN.

PERCENT PASSING



a. Surber sampler.



b. Periphyton sampler.

Figure B-5-21
DEVICES FOR SAMPLING BENTHOS AND PERIPHYTON

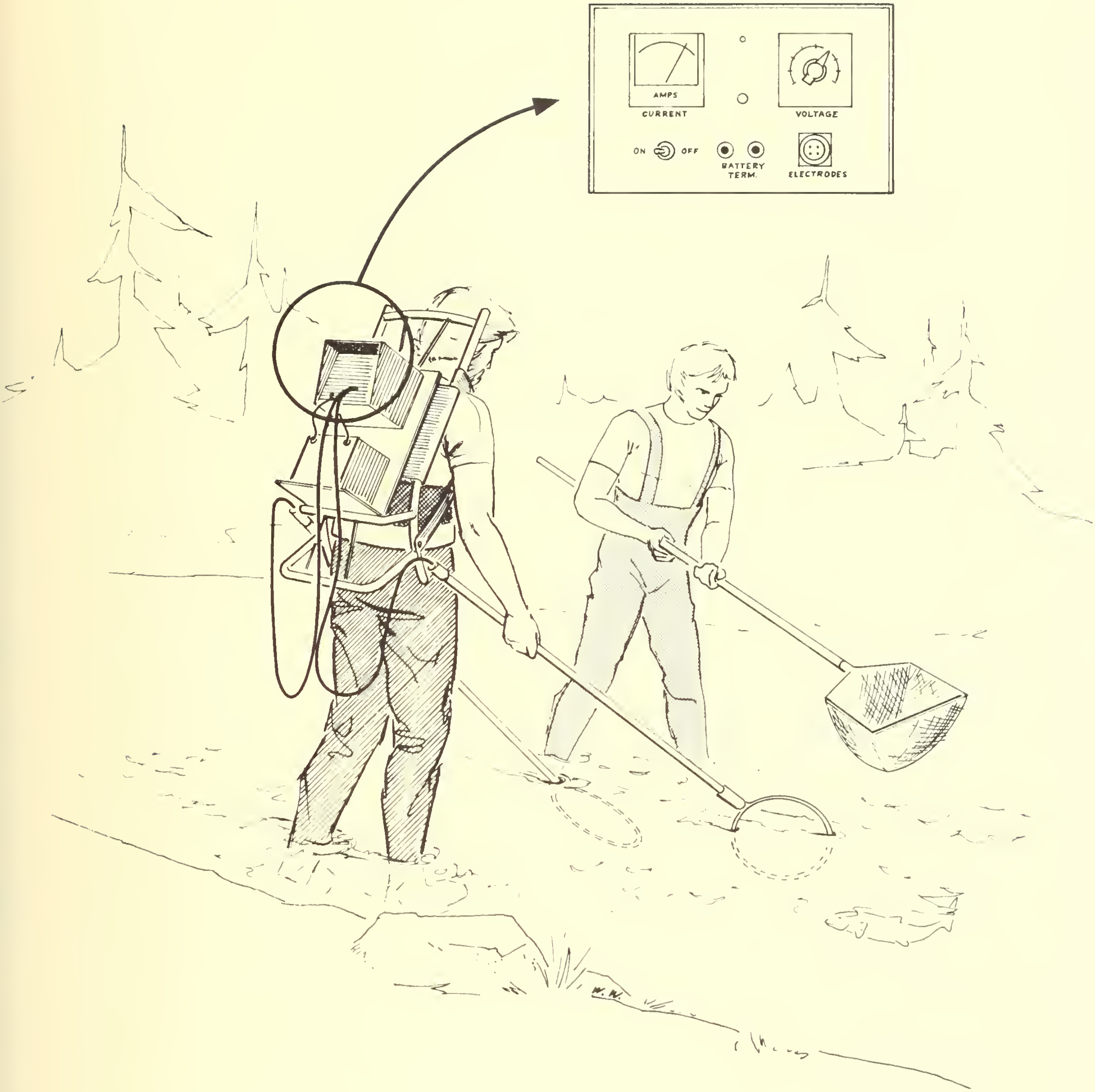
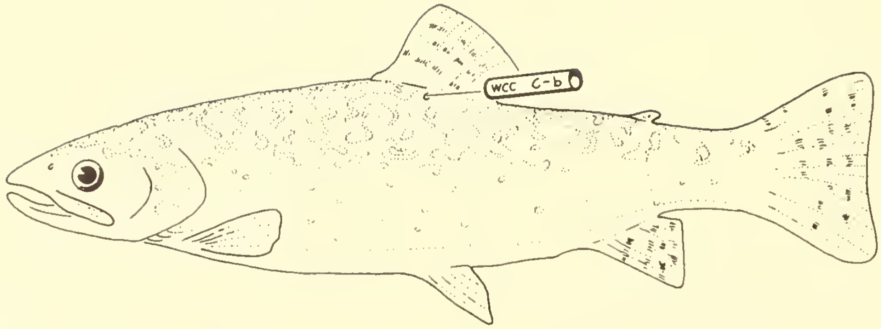
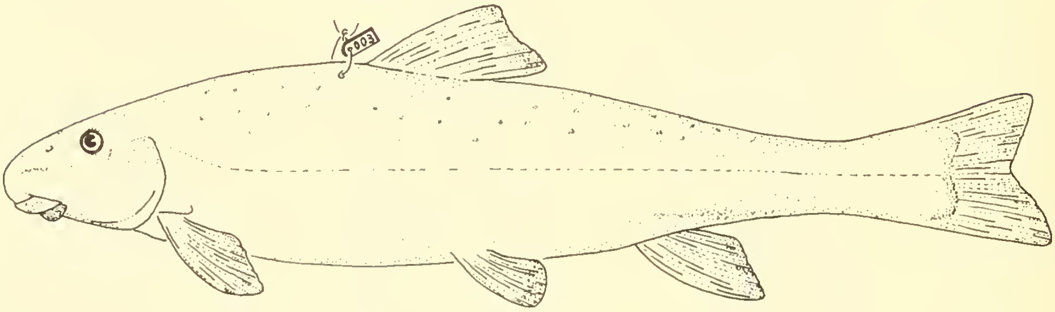


Figure B-5-22
PORTABLE VARIABLE-VOLTAGE BACKPACK SHOCKER FOR CAPTURING FISH.



a. Anchor tag attached to trout.



b. Fingerling tag attached to sucker.

Figure B-5-23
TYPES OF TAGS USED IN FISH STUDIES.

Table B-5-1a MONTHLY WATER QUALITY SAMPLE ANALYSES FOR PICEANCE CREEK STATIONS

STATION: P-1

Note: ND = Not Detected

CONSTITUENTS	1974					1975						1976			
	Aug	Sep	Oct	Nov	Dec	Jan	Mar	May	Jul	Sep	Nov	Jan	Mar	May*	Jul
Temperature (°F)	61.0°	56.0°	54.0°	39.2°	32.0°	Frozen	43.0°	46.0°	58.1°	46.4°	34.0°	30.2°	33.8°		
pH	8.2	8.1	8.3	8.1	8.2	Over	8.3	8.4	8.3	8.5	8.3	8.14	8.29		8.17
Dissolved Oxygen (mg/l)	7.0	10.0	11.0	14.9	15.0		15.0	10.5	10.9	15.0	14.5	15.0	15.0		
Conductivity (μ mhos/cm)	1075	1125	1200	1200	1280		1200	920	1300	1300	1300	1200	1200		1300
Total Solids (ppm)	636	716	920	888	728		916	600	770	700	708	736	708		812
Total Alkalinity ($CaCO_3$)(ppm)	320	410	430	390	445		440	370	475	460	435	400	410		470
Total Hardness ($CaCO_3$)(ppm)	260	310	330	290	350		320	291	345	360	400	320	335		360
CATIONS (ppm)															
Calcium (Ca)	22	66	52	52	76		60	60	72	74	82	64	52		82
Magnesium (Mg)	50	35	49	39	39		41	34	40	43	67	39	50		38
Sodium (Na)	120	138	140	148	128		128	75	144	124	116	134	132		128
Potassium (K)	2.8	1.9	3.1	2.5	2.5		2.8	1.7	5.0	4.0	3.8	3.6	3.7		4.4
Ammonia (NH_4)	0.89	0	0	0.1	0		0.48	0.06	0.59	0.03	0.54	0.10	0.26		0.29
ANIONS (ppm)															
Hydroxide (OH)	0	0	0	0	0		0	0	0	0	0	0	0		0
Carbonate (CO_3)	24	12	6	18	0		0	0	24	12	12	0	12		30
Bicarbonate (HCO_3)	342	476	512	439	543		537	451	531	537	506	488	471		512
Sulfate (SO_4)	166	155	165	152	160		145	83	144	162	167	180	153		155
Chloride (Cl)	25	17	20	25	20		15	8.0	15	4.0	16.0	15	15		13
Nitrate (NO_3)	1.4	0.35	0.13	1.6	1.4		0.98	4.4	0.93	1.8	2.0	1.9	1.7		1.8
Boron (B)	0.38	0.18	0.17	0.25	0.18		0.26	2.4	0.20	0.27	0.36	0.24	0.45		0
Silica (SiO_2)	16	14	17	18	18		17	12	18	17	17	16	14		15
Iron (Fe)	0.74	0.83	0.43	1.1	1.3		0.48	29	1.3	0.63	1.2	0.40	2.6		5.3
Manganese (Mn)	0	0	0	0	0		0	0	0	0	0	0	0		0
NUTRIENTS (ppm)															
Ortho Phosphate (PO_4)	0.04	0.08	0.05	0.07	0.00		0.08	0.00	0.04	0.07	0	0.14	0.07		0.06
Nitrite (N)	0	0.001	0	0	0		0	0	0	0.014	0.010	0	0.010		0.023
Nitrate (N)	0.31	0.08	0.003	0.36	0.31		0.22	0.99	0.21	0.40	0.44	0.43	0.38		0.41
Ammonia (N)	0.69	0	0	0.08	0		0.37	0.05	0.46	0.02	0.42	0.08	0.20		0.23
MICROBIOLOGY															
Standard Plate Count/ml at 35°C	840	1000	210,000	280,000	170,000		50,000	11,000	130,000	2,300	3,700	1400	1700		2200
Coliform MPN/100 ml	4600	43	110	23	1100		1100	≥24,000	4600	1,500	4,600	1500	240		4600
Fecal Coliform MPN/100 ml	43	9	<3	4	23		23	2400	460	460	46	43	<3		1500
Fecal Streptococci MPN/100 ml	-	< 3	93	43	43		280	< 3	240	240	< 3	15	9		310
Pathogens	-	ND	ND	NO	NO		NO	ND	NO	NO	ND	ND	ND		ND
SEDIMENT ANALYSIS															
% Moisture								21.6		33.9					
% TKN								0.027	0.023	0.11					
% COD								0.49	0.63	2.9					
% Volatile Solids								1.7		5.4					

* Not sampled

Table B-5-1a (Continued)

STATION: P-2

Note: ND = Not Detected

CONSTITUENTS	1974					1975						1976			
	Aug	Sep	Oct	Nov	Dec	Jan	Mar	May	Jul	Sep	Nov	Jan	Mar	May	Jul
Temperature (°F)	59°	51°	52°	40°	32°	32°	43°	46°	56°	46.4°	34°	35.8°	32°	46.8°	
pH	8.2	8.9	8.2	8.0	8.2	8.3	8.2	8.4	8.3	8.5	8.4	8.32	8.32	8.32	8.10
Dissolved Oxygen (mg/l)	6	11	11	15	15	15	15	10.3	9.9	15.0	15.0	15.0	10.0	10.4	
Conductivity (μ mhos/cm)	1025	1225	1300	1490	1490	1000	1400	950	1380	1350	1350	1450	1150	1300	1450
Total Solids (ppm)	704	756	1016	928	852	928	1008	640	800	760	696	888	764	720	904
Total Alkalinity ($CaCO_3$)(ppm)	310	410	420	400	465	470	440	358	485	450	440	420	400	435	500
Total Hardness ($CaCO_3$)(ppm)	240	375	420	360	455	470	420	283	420	412	430	453	278	400	410
CATIONS (ppm)															
Calcium (Ca)	20	67	70	60	80	88	72	64	88	86	80	88	62	88	64
Magnesium (Mg)	46	50	60	51	62	61	58	30	49	48	56	57	30	44	61
Sodium (Na)	136	144	144	144	132	138	132	82	134	128	120	134	128	120	150
Potassium (K)	2.9	2.0	2.5	2.2	2.3	2.3	2.3	2.5	5.1	4.4	3.6	3.5	3.7	5.2	5.5
Ammonia (NH_4)	0	0	0.09	0.09	0	0.13	0.36	0	0.27	0.05	0.29	0.10	0.23	0.17	0.45
ANIONS (ppm)															
Hydroxide (OH)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbonate (CO_3)	24	12	6	12	12	24	0	0	18	12	0	12	24	12	12
Bicarbonate (HCO_3)	329	476	500	464	543	525	537	437	555	525	537	488	439	506	586
Sulfate (SO_4)	163	222	262	229	246	277	218	104	191	210	200	315	157	195	205
Chloride (Cl)	25	19	20	20	20	25	15	9.0	14	3.0	15.0	12	15	15	15
Nitrate (NO_3)	1.6	1.3	2.1	3.3	5.9	4.3	3.7	0.86	1.6	3.3	2.1	4.4	1.5	1.8	1.3
Boron (B)	0.38	0.15	0.17	0.17	0.18	0.10	0.25	2.8	0.12	0.21	0.24	0.20	0.38	0.06	0
Silica (SiO_2)	16	16	18	18	18	19	16	12	18	17	17	15	15	16	16
Iron (Fe)	1.1	0.09	0.12	0.40	1.2	0.91	0.91	30	0.84	0.92	2.1	0.48	2.3	1.7	1.3
Manganese (Mn)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NUTRIENTS (ppm)															
Ortho Phosphate (PO_4)	0	0	0.02	0	0	0.06	0.08	0	0.04	0.08	0	0.07	0.11	0.12	0.06
Nitrite (N)	0	0.001	0	0.04	0.005	0.008	0	0	0	0.017	0.017	0	0.017	0	0.017
Nitrate (N)	0.36	0.03	0.26	0.74	1.3	0.97	0.84	0.19	0.36	0.75	0.48	0.99	0.34	0	0.30
Ammonia (N)	0	0	0.07	0.07	0	0.10	0.28	0	0.21	0.05	0.22	0.08	0.18	0.41	0.35
MICROBIOLOGY															
Standard Plate Count/ml at 35°C	-	210	93,000	820,000	190,000	20,000	710,000	28,000	35,000	2,800	5,000	2100	3500	10000	3900
Coliform MPN/100 ml	-	11,000	1500	24,000	280	1100	460	11,000	4600	11,000	750	460	11000	1100	11000
Fecal Coliform MPN/100 ml	-	9	< 3	< 3	43	23	23	1500	210	240	75	93	7	460	460
Fecal Streptococci MPN/100 ml	-	< 3	21	23	93	7	43	93	21	28	14	4	23	43	750
Pathogens	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SEDIMENT ANALYSIS															
% Moisture								23.8							
% TKN								0.019	0.017						
% COD								0.37	0.63						
% Volatile Solids								1.3							

Table B-5-1a (Continued)

STATION : P-3

Note ND = Not Detected

CONSTITUENTS	1974 Aug	1974 Sep	1974 Oct	1974 Nov	1974 Dec	1975 Jan	1975 Mar	1975 May	1975 Jul	1975 Sep	1975 Nov	1976 Jan	1976 Mar	1976 May	1976 Jul
Temperature (°F)	59°	51°	51°	39°	32°	32°	43°	46°	55°	46.4	34	30.2°	33.8°	45.5°	
pH	8.2	9.0	8.2	8.2	8.2	8.2	8.3	8.5	8.3	8.6	8.4	8.30	8.3	8.42	8.16
Dissolved Oxygen (mg/l)	6	11	11	15	15	15	15	12.2	15.0	15.0	15.0	15.0	9.75	10.9	
Conductivity (μ mhos/cm)	1075	1225	1300	1380	1540	850	1350	940	1500	1400	1400	1450	1400	1350	1600
Total Solids (ppm)	724	764	956	952	920	936	964	692	860	780	760	872	800	764	880
Total Alkalinity (CaCO$_3$) (ppm)	325	370	430	410	460	425	420	355	490	472	440	380	425	440	560
Total Hardness (CaCO$_3$) (ppm)	245	340	430	390	460	460	385	290	440	415	450	460	365	395	440
CATIONS (ppm)															
Calcium (Ca)	22	44	68	68	84	84	64	60	96	86	96	104	70	86	83
Magnesium (Mg)	46	56	63	53	61	61	56	34	49	49	51	49	46	44	56
Sodium (Na)	136	141	144	140	140	141	135	80	150	128	124	135	144	130	154
Potassium (K)	2.9	2.0	2.3	2.3	2.3	2.3	2.3	1.9	5.0	4.4	3.8	3.5	3.7	5.0	5.1
Ammonia (NH$_4$)	0	0	0	0.18	0	0.08	0.19	0	0.34	0.26	0.23	0.12	-	0.17	-
ANIONS (ppm)															
Hydroxide (OH)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbonate (CO$_3$)	36	12	12	6	12	12	0	0	24	6	0	18	18	30	30
Bicarbonate (HCO$_3$)	323	427	500	488	537	494	512	433	549	564	537	427	432	476	622
Sulfate (SO$_4$)	186	232	277	234	275	287	216	116	237	218	238	338	244	201	239
Chloride (Cl)	20	19	20	25	20	25	15	9.0	14	4.0	13	8.3	14	16	15
Nitrate (NO$_3$)	2.0	1.7	1.2	2.9	6.2	5.7	3.2	5.3	1.5	0.44	3.1	5.3	3.6	2.1	1.4
Boron (B)	0.17	0.18	0.18	0.17	0.18	0.20	0.30	2.3	0.15	0.23	0.26	0.22	0.26	0.18	0
Silica (SiO$_2$)	16	18	18	18	18	19	16	13	18	14	17	15	15	15	19
Iron (Fe)	1.0	1.3	0.21	1.6	1.2	1.1	1.9	35	1.1	1.7	3.2	1.0	1.4	1.7	2.1
Manganese (Mn)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NUTRIENTS (ppm)															
Ortho Phosphate (PO$_4$)	0	0	0.04	0.04	0.08	0.05	0.06	0	0.06	0.05	0	0.12	0.12	0.14	0.08
Nitrite (N)	0	0.005	0	0.008	0	0	0	0	0	0.017	0.008	0	0.017	0	0.010
Nitrate (N)	0.45	0.38	0.26	0.66	1.4	1.3	0.72	1.2	0.33	0.10	0.69	1.2	0.80	0.48	0.31
Ammonia (N)	0	0	0	0.15	0	0.06	0.14	0	0.26	0.20	0.18	0.09	0.18	0.13	0.01
MICROBIOLOGY															
Standard Plate Count / ml at 35°C	7600	190	180,000	270,000	190,000	35,000	5,700	41,000	28,000	2,600	9,700	550	3500	7400	3500
Coliform MPN / 100 ml	4600	2,400	>24,000	750	750	460	2400	2,100	4600	2,400	1,100	1,100	1500	11000	>24000
Fecal Coliform MPN / 100 ml	240	9	< 3	< 3	3	460	240	460	1100	2,400	23	75	23	4600	240
Fecal Streptococci MPN / 100 ml	-	< 3	240	39	9	240	43	< 3	460	43	7	43	23	240	280
Pathogens	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SEDIMENT ANALYSIS															
% Moisture								21.5		22.2					
% TKN								0.025	0.015	0.030					
% COD								0.86	0.77	0.74					
% Volatile Solids								2.1		2.4					

Table B-5-1a (Continued)

STATION: P-4

Note ND = Not Detected

CONSTITUENTS	1974					1975						1976			
	Aug	Sep	Oct	Nov	Dec	Jan	Mar	May	Jul	Sep	Nov	Jan	Mar	May	Jul
Temperature (°F)	59°	51°	51°	39°											
pH	8.2	9.1	8.2	8											
Dissolved Oxygen (mg/l)	6	11	11	15											
Conductivity (μ mhos/cm)	1075	1275	1300	1480											
Total Solids (ppm)	758	764	1016	968											
Total Alkalinity ($CaCO_3$)(ppm)	330	365	430	410											
Total Hardness ($CaCO_3$)(ppm)	270	350	430	390											
CATIONS (ppm)															
Calcium (Ca)	28	52	68	68											
Magnesium (Mg)	49	53	63	53											
Sodium (Na)	136	144	156	140											
Potassium (K)	3.1	1.9	2.7	2.3											
Ammonia (NH_4)	0	0	0	0.25											
ANIONS (ppm)															
Hydroxide (OH)	0	0	0	0											
Carbonate (CO_3)	30	12	18	6											
Bicarbonate (HCO_3)	342	421	488	488											
Sulfate (SO_4)	193	236	287	246											
Chloride (Cl)	25	15	20	25											
Nitrate (NO_3)	1.5	1.8	1.2	2.9											
Boron (B)	0.18	0.15	0.17	0.17											
Silica (SiO_2)	61	19	19	18											
Iron (Fe)	0.26	0.60	0.16	1.4											
Manganese (Mn)	0	0	0	0											
NUTRIENTS (ppm)															
Ortho Phosphate (PO_4)	0	0	0	0.17											
Nitrite (N)	0	0.005	0	0.005											
Nitrate (N)	0.34	0.41	0.27	0.65											
Ammonia (N)	0	0	0	0.19											
MICROBIOLOGY															
Standard Plate Count/ml at 35°C	840	-	-	570,000											
Coliform MPN/100ml	>24,000			2400											
Fecal Coliform MPN/100ml	240			9											
Fecal Streptococci MPN/100ml				93											
Pathogens															
SEDIMENT ANALYSIS															
% Moisture															
% TKN															
% COD															
% Volatile Solids															

Table B-5-1a (Continued)

STATION: P-5

Note ND = Not Detected

CONSTITUENTS	1974 Aug	1974 Sep	1974 Oct	1974 Nov	1974 Dec	1975 Jan	1975 Mar	1975 May	1975 Jul	1975 Sep	1975 Nov	1976 Jan	1976 Mar	1976 May	1976 Jul
Temperature (°F)	59°	50	49°	38°	32°	32°	43°	47°	55°	46.4°	34°	30.2°	32.0°	44.6°	
pH	8.4	9.2	8.3	8.0	8.3	8.3	8.2	8.4	8.3	8.5	8.5	8.2	8.3	8.4	8.10
Dissolved Oxygen (mg/l)	6	10.0	11.0	15	15	15	15	10.2	10.4	15.0	15.0	15.0	12.0	11.7	
Conductivity (µ mhos/cm)	1075	1300	1300	1420	1470	690	1420	1000	1650	1350	1500	1480	1450	1400	1600
Total Solids (ppm)	676	744	1020	984	810	940	1044	676	910	730	776	904	888	780	964
Total Alkalinity ($CaCO_3$)(ppm)	340	370	440	435	420	390	440	368	540	412	465	360	430	445	520
Total Hardness ($CaCO_3$)(ppm)	270	350	435	395	410	420	400	310	470	390	460	435	425	415	465
CATIONS (ppm)															
Calcium (Ca)	22	48	70	66	64	64	60	66	92	76	86	73	104	92	102
Magnesium (Mg)	52	56	63	56	61	63	61	35	58	49	60	61	40	45	51
Sodium (Na)	130	138	160	136	*	141	140	85	160	132	132	138	140	134	164
Potassium (K)	3.5	1.9	2.8	2.5	*	2.5	2.5	2.3	6.2	4.4	3.8	3.5	3.7	5.3	5.7
Ammonia (NH_4)	0	0	0.06	0.05	0	0	0.40	0	0.55	0.03	0.31	0.13	0.22	0.14	0.14
ANIONS (ppm)															
Hydroxide (OH)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbonate (CO_3)	36	12	12	18	48	30	0	0	12	0	0	12	18	30	30
Bicarbonate (HCO_3)	342	427	512	494	415	415	537	449	634	503	567	415	488	482	573
Sulfate (SO_4)	160	227	287	244	275	305	242	130	240	231	238	335	249	218	239
Chloride (Cl)	30	15	20	20	20	25	12	10	1.0	15	14	12	12	16	14
Nitrate (NO_3)	1.9	1.6	1.0	2.9	5.9	6.3	3.2	1.5	15	4.2	2.2	4.9	3.9	1.8	1.2
Boron (B)	0.25	0.15	0.17	0.17	0.18	0.20	0.29	2.3	0.63	0.21	0.52	0.30	0.29	0.08	0
Silica (SiO_2)	17	19	19	19	18	21	16	14	19	17	17	15	15	15	16
Iron (Fe)	0.43	1.1	0.21	1.7	*	1.4	3.2	6.6	0.80	0.81	2.0	0.20	2.2	1.0	1.1
Manganese (Mn)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NUTRIENTS (ppm)															
Ortho Phosphate (PO_4)	0	0.02	0.05	0.02	0	0.04	0.08	0.02	0.15	0.06	0	0.04	0.12	0.11	0.09
Nitrite (N)	0	0.005	0	0.008	*	0.02	0	0	0	0.02	0.005	0	0.023	0	0.005
Nitrate (N)	0.44	0.37	0.23	0.66	1.3	1.4	0.72	0.33	0.27	0.96	0.49	1.1	0.88	0.40	0.28
Ammonia (N)	0	0	0.05	0.04	0	0	0.31	0	0.43	0.02	0.24	0.10	0.17	0.11	0.11
MICROBIOLOGY															
Standard Plate Count/ml at 35°C	5100	500	180,000	420,000	*	26,000	29,000	43,000	1500	6,200	35,000	550	2600	8400	2600
Coliform MPN/100 ml	4600	1100	2400	2400	*	93	4600	>24,000	4600	4,600	1,500	390	1100	2100	>24000
Fecal Coliform MPN/100 ml	93	1100	< 3	21	*	93	240	11,000	460	240	43	93	4	1200	460
Fecal Streptococci MPN/100 ml	-	<3	200	150	*	23	460	75	2400	240	23	24	75	23	1500
Pathogens															
SEDIMENT ANALYSIS								24,3							
% Moisture								0,028	0,033						
% TKN								0,59	0,79						
% COD								2,0							
% Volatile Solids															

* Sample lost en route to laboratory

Table B-5-1a (Continued)

STATION: P-5A

Note: ND = Not Detected

CONSTITUENTS	1974 Aug	1974 Sep	1974 Oct	1974 Nov	1974 Dec	1975 Jan	1975 Mar	1975 May	1975 Jul	1975 Sep	1975 Nov	1976 Jan	1976 Mar	1976 May	1976 Jul
Temperature (°F)				37°	32°	32°	38°	47°	55°	48°	35.6°	30.2°	33.8°	46.4°	
pH				8,0	8.2	8.3	8.3	8.4	8.2	8.5	8.3	8.1	8.33	8.23	8.10
Dissolved Oxygen (mg/l)				15	15	15	15	12.9	10.1	15.0	15.0	15.0	15.0	10.2	
Conductivity (μ mhos/cm)				1330	1500	690	1580	15	1650	1350	1450	1275	1450	1680	1700
Total Solids (ppm)				936	856	950	980	640	920	790	788	904	824	912	928
Total Alkalinity ($CaCO_3$)(ppm)				370	460	435	430	349	540	420	450	390	435	510	540
Total Hardness ($CaCO_3$)(ppm)				335	440	450	375	329	475	382	440	423	420	485	480
CATIONS (ppm)															
Calcium (Ca)				48	72	74	68	70	92	35	92	72	80	100	89
Magnesium (Mg)				57	63	64	61	37	60	47	51	59	53	57	66
Sodium (Na)				140	140	147	132	88	170	128	132	146	140	164	176
Potassium (K)				2.5	2.5	2.5	2.5	3.6	6.8	4.6	3.8	3.6	3.8	7.2	5.9
Ammonia (NH_4)				0.07	0	0	0.21	0	0.34	0.03	0.40	0.09	0.20	0.18	0.10
ANIONS (ppm)															
Hydroxide (OH)				0	0	0	0	0	0	0	0	0	0	0	0
Carbonate (CO_3)				18	0	12	0	0	0	0	0	18	24	12	30
Bicarbonate (HCO_3)				415	561	506	525	426	659	512	549	439	482	598	598
Sulfate (SO_4)				257	249	308	183	137	267	229	246	348	252	287	254
Chloride (Cl)				20	20	30	10	10	15	14	16	12	12	16	15
Nitrate (NO_3)				2.9	5.4	4.6	2.7	4.2	1.2	3.0	1.9	2.9	3.0	1.5	1.1
Boron (B)				0.50	0.18	0.30	0.36	2.3	0.44	0.25	0.66	0.18	0.36	0.12	0
Silica (SiO_2)				15	18	20	17	13	20	17	17	15.0	15	15	16
Iron (Fe)				0.70	0.57	0.53	2.1	12	0.38	0.72	3.0	0.43	2.5	0.44	1.5
Manganese (Mn)				0	0	0	0	0	0	0	0	0	0	0	0
NUTRIENTS (ppm)															
Ortho Phosphate (PO_4)				0.21	0	0	0.09	0.02	0.13	0.07	0	0.11	0.12	0.16	1.0
Nitrite (N)				0.04	0.008	0.014	0	0.01	0	0.017	0.010	0	0.0023	0	0.008
Nitrate (N)				0.66	1.2	1.0	0.60	0.96	0.27	0.68	0.44	0.65	0.68	0.33	0.24
Ammonia (N)				0.05	0	0	0.16	0	0.26	0.02	0.31	0.07	0.16	0.14	0.08
MICROBIOLOGY															
Standard Plate Count/ml at 35°C				180,000	555,000	36,000	81,000	253,000	18,000	10,000	2,200	630	1900	5000	1400
Coliform MPN/100ml				460	93	93	1100	11,000	240	1,100	1,100	750	460	4600	4600
Fecal Coliform MPN/100ml				43	43	93	23	1100	43	460	23	43	93	460	240
Fecal Streptococci MPN/100ml				93	4	43	93	43	93	14	23	93	4	<3	210
Pathogens															
SEDIMENT ANALYSIS								29.8		23.5					
% Moisture								0.074	0.071	0.021					
% TKN								0.92	0.62	0.72					
% COD								2.6		2.2					
% Volatile Solids															

Table B-5-1a (Continued)

STATION : P-6

Note ND = Not Detected

CONSTITUENTS	1974					1975						1976			
	Aug	Sep	Oct *	Nov *	Dec*	Jan	Mar*	May *	Jul *	Sep *	Nov *	Jan*	Mar *	May *	Jul *
Temperature (°F)	57°	47°	50°	44°	41°	34°	42°	50°	70°	60°	43°	38°	45°	61°	65°
pH	8.4	8.8	7.8	8.3	8.3	8.1	8.7	-	8.4	8.5	8.6	8.5	8.3	8.5	8.4
Dissolved Oxygen (mg/l)	6	10	9.0	-	11.2	11.1	9.0	8.0	6.4	9.9	-	10.9	10.6	12.3	11.5
Conductivity (μ mhos/cm)	1075	1475	1550	1800	1200	1390	1225	950	1460	1250	-	1200	1200	1390	1550
Total Solids (ppm)	680	880	1030	1164		878		639	1000	833	817	823	798	928	1030
Total Alkalinity (CaCO$_3$)(ppm)	365	415	542	465	463	447	455	377	556	428	448	406	386	473	500
Total Hardness (CaCO$_3$)(ppm)	310	400		505		460			510	430	440	460	450	490	530
CATIONS (ppm)															
Calcium (Ca)	32	58	83	70	87	79	82	63	85	67	85	80	80	76	83
Magnesium (Mg)	56	62	78	80	66	64	70	46	72	64	56	62	61	73	78
Sodium (Na)	144	159	170	178	140	140	130	100	170	140	120	120	120	170	190
Potassium (K)	3.5	2.0	4.3	2.5	2.6	2.6	3.9	3.5	4.5	2.9	3.9	2.4	2.8	3.4	4.0
Ammonia (NH$_4$)	0	0		0.32		.05			.05	.00	.05	.04	.05	.03	0
ANIONS (ppm)															
Hydroxide (OH)	0	0	-	0	-		-	-							
Carbonate (CO$_3$)	48	12	-	18	0	0	39	0	0	0	0	0	0	0	0
Bicarbonate (HCO$_3$)	348	482	661	531	565	545	475	460	678	522	546	495	471	577	610
Sulfate (SO$_4$)	218	277	330	389	280	290	260	170	300	270	250	280	270	290	390
Chloride (Cl)	30	15	14	20	12	12	14	11	15	13	13	13	11	14	16
Nitrate (NO$_3$)	1.6	0.80	-	2.3	2.8		2.9	3.0							
Boron (B)	0.18	0.18	0.230	0.42	0.220	180	0.160	0.14	240	190	200	140	200	770	240
Silica (SiO$_2$)	18	20	19	22	16	17	13	15	20	16	16	15	15	15	14
Iron (Fe)	0.19	1.3	0.030	12	0.110	10	0.030	0.030	20	20	20	20	-	510	90
Manganese (Mn)	0	0	0.170	0	0.040	20	0.030	0.010	120	40			30		
NUTRIENTS (ppm)															
Ortho Phosphate (PO$_4$)	0.07	0	0.12	0.22	0.06	.02	0.09	0.06	.04	.00	.03	.01	.00	.00	.05
Nitrite (N)	0	0.003	-	0.025	0.01	.01	0.01	0	.01	.01					
Nitrate (N)	0.37	0.18	-	0.51	0.64	77	0.66	0.68	.18	.36	.49	.75	.55	.08	.07
Ammonia (N)	0	0	-	0.29		.04			.04	.00	.05	.04	.05	.03	0
MICROBIOLOGY															
Standard Plate Count / ml at 35°C	5100	220													
Coliform MPN / 100 ml	4600	2,400													
Fecal Coliform MPN / 100 ml	93	460			3		12				-	-	-	-	-
Fecal Streptococci MPN / 100 ml	-	<3									-	-	360	-	-
Pathogens															
SEDIMENT ANALYSIS															
% Moisture								27.8							
% TKN								0.035							
% COD								1.1							
% Volatile Solids								2.0							

* U.S.G.S. Data

Table B-5-1a (Continued)

STATION: P-7

Note: ND = Not Detected

CONSTITUENTS	1974					1975						1976			
	Aug	Sep	Oct	Nov	Dec	Jan	Mar	May	Jul	Sep	Nov	Jan	Mar	May	Jul
Temperature (°F)	-	46	40°	32°	32°	Frozen	36°	48°	56°	50°	34°	Frozen	32.0°	44.6°	
pH		8.8	8.4	8.3	8.3	Over	8.0	8.2	8.3	8.3	8.3	over	8.34	8.4	8.27
Dissolved Oxygen (mg/l)		10	11	15	15		15	10.3	10.4	15.0	15.0		15.0	10.2	
Conductivity (μ mhos/cm)		2800	720	1075	1700		1730	1350	2600	1680	1750		1850	2300	2100
Total Solids (ppm)		1524	1500		1032		1152	884	1400	1010	996		1080	1352	1358
Total Alkalinity (CaCO$_3$)(ppm)		620	565		440		510	445	710	470	485		530	570	510
Total Hardness (CaCO$_3$)(ppm)		680	605		490		520	420	660	480	540		515	660	660
CATIONS (ppm)															
Calcium (Ca)		70	84		82		76	71	100	78	90		100	96	106
Magnesium (Mg)		123	96		69		19	59	100	69	77		64	102	96
Sodium (Na)		280	224		164		172	120	292	154	152		184	240	186
Potassium (K)		3.5	31		2.5		2.7	2.5	8.4	5.8	4.4		5.3	9.4	7.0
Ammonia (NH$_4$)		0	0.03		0		0.33	0	0.49	0.05	0.50		0.41	0.19	0.27
ANIONS (ppm)															
Hydroxide (OH)		0	0		0		0	0	0	0	0		0	0	0
Carbonate (CO$_3$)		36	36		12		0	12	30	0	0		18	18	42
Bicarbonate (HCO$_3$)		683	616		512		622	519	805	573	592		610	659	537
Sulfate (SO$_4$)		575	498		389		338	233	539	361	371		375	520	520
Chloride (Cl)		24	25		20		14	12	19	14	16		13	19	18
Nitrate (NO$_3$)		0.40	0.44		2.3		2.1	5.4	0.40	2.6	2.0		2.3	0.09	1.3
Boron (B)		0.28	0.17		0.27		0.56	2.3	0.98	0.65	0.22		0.48	0.10	0.05
Silica (SiO$_2$)		21	21		20		20	16	16	19	18		17	14	16
Iron (Fe)		2.5	1.3		3.0		6.2	35	8.5	23	6.4		5.5	0.20	10
Manganese (Mn)		0	0		0		0	0	0	0	0		0	0	0
NUTRIENTS (ppm)															
Ortho Phosphate (PO$_4$)		0.14	0.07		0		0.19	0.04	0.30	0.13	0		0.20	0.05	0.18
Nitrite (N)		0.006	0		0		0.023	0	0.008	0.008	0.005		0.028	0	0.010
Nitrate (N)		0.09	0.10		0.51		0.48	1.2	0.09	0.59	0.45		0.52	0.02	0.29
Ammonia (N)		0	0.02		0		0.26	0	0.38	0.04	0.39		0.32	0.15	0.21
MICROBIOLOGY															
Standard Plate Count/ml at 35°C		110	300,000	590,000	3,200,000		4,300	48,000	21,000	8,100	9,500		5300	8100	16000
Coliform MPN/100 ml		390	24,000	>24,000	24,000		2400	>24,000	2400	11,000	2,400		640	1100	>24000
Fecal Coliform MPN/100 ml		<3	< 3	93	43		23	2,400	750	1,100	1,100		150	460	460
Fecal Streptococci MPN/100 ml		<3	240	240	1100		460	460	460	28	93		240	460	460
Pathogens		ND	ND	ND	ND		ND	ND	ND	ND	ND		ND	ND	ND
SEDIMENT ANALYSIS															
% Moisture								25.0		24.0					
% TKN								0.032	0.015	0.047					
% COD								0.72	5.93	1.4					
% Volatile Solids								2.0		2.9					

Table B-5-1b MONTHLY WATER QUALITY SAMPLE ANALYSES FOR STEWART CREEK STATIONS

STATION: S-1

Note: ND = Not Detected

CONSTITUENTS	1974					1975						1976			
	Aug	Sep	Oct *	Nov *	Dec *	Jan *	Mar *	May*	Jul *	Sep *	Nov *	Jan *	Mar *	May *	Jul *
Temperature (°F)	57°		48°	43°	34°	33°	54°	51°	54.5°	55°	48°	43°	50°	55°	
pH	9.0	8.3	7.8	7.4	8.4	7.2	8.4	8.1	8.2	8.2	8.2	8.5	8.3	8.3	8.20
Dissolved Oxygen (mg/l)	6		8.4	10.5	9.9	10.6	10.4	10.0	8.8	10.2	10.0	11.1	10.2	10.3	
Conductivity (µ mhos/cm)	1400	1550	1400	1750	1300	1400	1300	1350	1400	1250	1380	1350	1340	1350	1700
Total Solids (ppm)	980	884	921	1160	963	953	958	939	932	945	949	926	873	924	868
Total Alkalinity ($CaCO_3$)(ppm)	330	350	422	611	472	418	422	394	381	399	425	399	355	384	430
Total Hardness ($CaCO_3$)(ppm)	460	495							550	570	550	560	540	560	550
CATIONS (ppm)															
Calcium (Ca)	38	72	95	89	96	93	97	93	99	95	98	96	92	95	84
Magnesium (Mg)	89	77	70	64	77	76	86	80	74	81	74	77	75	79	83
Sodium (Na)	160	136	120	250	130	120	120	120	120	120	120	120	120	130	136
Potassium (K)	2.5	0.9	1.9	2.4	1.4	1.7	1.6	1.5	1.3	1.2	1.3	1.4	1.4	1.2	2.9
Ammonia (NH_4)	0	0	-	-	0.09	0.04	0.04	0.01	.00	.03	.00	.04	.04	.06	0
ANIONS (ppm)															
Hydroxide (OH)	0	0													0
Carbonate (CO_3)	36	12	-	-	0	0	38	0	0	0	0	0	0	0	30
Bicarbonate (HCO_3)	329	403	514	782	575	510	437	480	465	486	518	487	433	468	464
Sulfate (SO_4)	442	377	350	330	340	380	370	380	380	380	370	360	340	360	381
Chloride (Cl)	20	10	6.6	16.0	11.0	6.7	7.0	6.6	6.8	6.7	6.8	6.8	6.2	7.2	7.3
Nitrate (NO_3)	1.2	4.6	-	-	7.5	7.9	8.0	6.6	5.3	5.3					8.9
Boron (B)	0	0.17	110	530	260	120	80	80	80	80	80	80	180	110	0
Silica (SiO_2)	19	16	17	15	15	15	14	14	16	16					12
Iron (Fe)	0.05	0.02	20	20	10	10	20	20	10	10					0.1
Manganese (Mn)	0	0	0	0	0	10	30	8	0	10			<20		0
NUTRIENTS (ppm)															
Ortho Phosphate (PO_4)	0.04	0	0	0.03	0.03	0.03	0.09	0.09	.00	.02	.02	.00	.00	.01	0.09
Nitrite (N)	0	0.006	-	-	0	0.01	0	0	0	.01					0.005
Nitrate (N)	0.28	1.1	-	-	1.7	1.8	1.8	1.5	1.2	1.2	1.4	1.6	1.5	1.2	2.0
Ammonia (N)	0	0	-	-					.00	.02					0
MICROBIOLOGY															
Standard Plate Count/ml at 35°C	-	530													1500
Coliform MPN/100ml		240													1100
Fecal Coliform MPN/100ml		<3	-	-	-	-	-	-			-	-	<1	-	460
Fecal Streptococci MPN/100ml		<3									-	-	B20	-	75
Pathogens															
SEDIMENT ANALYSIS															
% Moisture								26.2							
% TKN								0.042							
% COD								0.70							
% Volatile Solids								1.8							

* U.S.G.S. Data

Table B-5-1b (Continued)

STATION: S-2

Note: ND = Not Detected

CONSTITUENTS	1974					1975						1976			
	Aug	Sep	Oct	Nov	Dec	Jan	Mar	May	Jul	Sep	Nov	Jan	Mar	May	Jul
Temperature (°F)	59°	-	50°	37°	32°	Frozen	43°	46°	53°	46°	37.5°	31.1°	37.4°	46.4°	
pH	9.0	8.3	8.4	8.0	8.4		8.3	8.2	8.0	8.3	8.4	8.1	7.94	7.98	8.14
Dissolved Oxygen (mg/l)	7		11	15	15		15	13.4	10.2	15.0	15.0	15.0	10.75	8.2	
Conductivity (μ mhos/cm)	1425	1600	1525	1750	1670		1550	1700	2000	1950	2000	1100	1650	1900	1500
Total Solids (ppm)	876	920	056	1076	992		996		1100	1110	1100	952	960	1116	844
Total Alkalinity (CaCO$_3$)(ppm)	295	390	425	430	370		370	449	480	510	510	340	410	465	510
Total Hardness (CaCO$_3$)(ppm)	425	500	550	520	550		490	570	640	658	660	530	535	640	430
CATIONS (ppm)								1048							
Calcium (Ca)	44	96	98	86	92		78	102	128	132	162	92	96	112	72
Magnesium (Mg)	77	63	74	74	78		72	77	78	80	62	73	72	87	61
Sodium (Na)	147	135	140	156	136		140	128	174	144	156	129	138	148	150
Potassium (K)	1.4	1.4	1.7	2.0	1.5		1.7	1.4	4.9	5.0	4.6	2.6	3.4	6.7	5.1
Ammonia (NH$_4$)	0	0	0.52	0.39	0		0.32	0.29	0.53	0.05	0.46	0.10	0.14	0.21	0.10
ANIONS (ppm)															
Hydroxide (OH)	0	0	0	0	0		0	0	0	0	0	0	0	0	0
Carbonate (CO$_3$)	18	12	30	24	30		24	12	0	0	0	0	12	0	36
Bicarbonate (HCO$_3$)	323	451	458	476	378		403	523	586	622	622	415	476	567	549
Sulfate (SO$_4$)	384	394	383	410	404		354	396	461	447	459	422	380	422	221
Chloride (Cl)	35	10	15	15	15		10	8.0	8.9	9.0	11	12	7.5	10	9.6
Nitrate (NO$_3$)	4.7	2.7	4.9	8.9	19		8.9	2.9	3.0	0.18	0.53	7.1	5.8	2.0	1.7
Boron (B)	0	0.08	0.17	18	17		12	15	0.24	0.17	0.12	0.18	0.24	0	0
Silica (SiO$_2$)	16	15	17	18	17		12	15	18	20	19	17	15	14	13
Iron (Fe)	0	0.02	0.03	0.44	0.33		0.89	3.0	0.50	0.60	7.6	2.3	0.07	0.23	3.5
Manganese (Mn)	0	0	0	0	0		0	0	0	0	0	0	0	0	0
NUTRIENTS (ppm)															
Ortho Phosphate (PO$_4$)	0.02	0	0.03	0.04	0.16		0.04	0	0.08	0.16	0.12	0.20	0.09	0.08	0.08
Nitrite (N)	0.01	0.006	0	0.008	0.009		0.005	0.017	0.008	0.003	0.044	0	0.008	0.008	0.023
Nitrate (N)	1.1	0.61	1.1	2.0	4.3		2.0	0.65	0.67	0.04	0.12	1.6	1.3	0.45	0.38
Ammonia (N)	0	0	0.40	0.30	0		0.25	0.23	0.41	0.04	0.36	0.08	0.11	0.16	0.08
MICROBIOLOGY															
Standard Plate Count/ml at 35°C	-	200	380,000	1,000,000	910,000		92,000	53,000	230,000	15,000	12,000	890	870	3500	12000
Coliform MPN/100ml		1100	>24,000	1200	4600		1500	4600	11,000	4,600	460	460	460	1100	11000
Fecal Coliform MPN/100ml		<3	< 3	70	< 3		240	<3	93	< 3	< 3	150	<3	93	390
Fecal Streptococci MPN/100ml		<3	93	200	15		43	<3	460	15	< 3	93	3	23	2400
Pathogens															
SEDIMENT ANALYSIS															
% Moisture								26.1		18.8					
% TKN								0.032	0.047	0.023					
% COD								0.56	1.28	0.44					
% Volatile Solids								1.2		2.7					

Table B-5-1b (Continued)

STATION: U.S.L.

Note ND = Not Detected

CONSTITUENTS	1974					1975						1976			
	Aug	Sep	Oct	Nov	Dec	Jan	Mar	May	Jul	Sep	Nov	Jan	Mar	May	Jul
Temperature (°F)	61°	52°	50°	FROZEN	FROZEN	FROZEN	FROZEN	52°	61°	50°	42.8°	FROZEN	FROZEN	51.9°	DRIED
pH	7.8	8.9	8.2	OVER	OVER	OVER	OVER	8.2	8.3	8.4	8.3	OVER	OVER	8.42	UP
Dissolved Oxygen (mg/l)	4	12.0	13.0					14.0	10.2	15.0	10.0			11.4	
Conductivity (µ mhos/cm)	1400	1600	1525					1730	1780	1850	1900			1650	
Total Solids (ppm)	940	1024	1064					1088	880	1050	1072			1016	
Total Alkalinity ($CaCO_3$)(ppm)	320	370	400					426	415	460	450			385	
Total Hardness ($CaCO_3$)(ppm)	480	620	620					578	580	610	620			500	
CATIONS (ppm)															
Calcium (Ca)	56	92	108					90	100	97	146			76	
Magnesium (Mg)	83	95	85					86	80	89	62			75	
Sodium (Na)	144	138	140					136	150	144	156			154	
Potassium (K)	17	1.7	2.0					1.4	4.5	4.0	2.9			4.2	
Ammonia (NH_4)	0.95	0	0.64						0.61	0.58	0.24			0.24	
ANIONS (ppm)															
Hydroxide (OH)	0	0	0					0	0	0	0			0	
Carbonate (CO_3)	12	[illegible]	0					18	24	0	0			0	
Bicarbonate (HCO_3)	366	427	488					483	458	561	549			470	
Sulfate (SO_4)	438	490	459					396	430	459	462			413	
Chloride (Cl)	19	15	15					8.0	8.4	8.0	11			9.4	
Nitrate (NO_3)	0.52	4.2	4.0					0.94	0.09	1.1	9.7			0.09	
Boron (B)	0	0.08	0.17					0.62	0.44	0.08	0.016			0	
Silica (SiO_2)	14	13	15					3.4	13	13	18			4.3	
Iron (Fe)	0.07	0	0.04					0.05	0.23	0.10	0.07			0.14	
Manganese (Mn)	0	0	0					0	0	0	0			0	
NUTRIENTS (ppm)															
Ortho Phosphate (PO_4)	0	0	0					0	0.02	0.02	0			0.07	
Nitrite (N)	0	0.006	0.025					0.023	0	0.008	0.014			0	
Nitrate (N)	0.12	0.94	0.91					0.21	0.02	0.25	2.2			0.02	
Ammonia (N)	0.74	0	0.49					0.38	0.47	0.45	0.18			0.19	
MICROBIOLOGY															
Standard Plate Count/ml at 35°C	1600	320	4000					9400	1100	1,800	530			570	
Coliform MPN/100 ml	1500	240	< 3					1100	1500	93	11,000			9	
Fecal Coliform MPN/100 ml	< 3	<3	< 3					< 3	7	7	< 3			4	
Fecal Streptococci MPN/100 ml	-	<3	< 3					< 3	22	4	150			<3	
Pathogens	-	ND	ND					-	-						
SEDIMENT ANALYSIS															
% Moisture								39.8		59.1					
% TKN								0.14	0.16	0.30					
% COD								2.4	4.67	9.4					
% Volatile Solids								3.7		11.2					

Table B-5-1b (Concluded)

STATION : L.S.L.

Note. ND = Not Detected

CONSTITUENTS	1974					1975						1976			
	Aug	Sep	Oct	Nov	Dec	Jan	Mar	May	Jul	Sep	Nov	Jan	Mar	May	Jul
Temperature (°F)	59°	48°	48°	46°	-	46°	45°	47°	55°	44.5°	41°	41.0°	41.0°	50.0°	
pH	7.4	8.6	8.4	5.5	5.7	8.2	8.4	7.7	8.0	8.4	8.1	8.2	8.01	7.97	7.64
Dissolved Oxygen (mg/l)	7	12	7.0	12.1		9	12	14.4	10.3	15.0	10.5	12.6	15.0	8.5	
Conductivity (μ mhos/cm)	1600	1325	1425	1500	1430	1450	1600	1600	1720	1800	1750	1300	1650	1600	1700
Total Solids (ppm)	848	888	948	984	976	980	1020	992	820	1020	910	900	988	976	1074
Total Alkalinity ($CaCO_3$) (ppm)	240	360	420	370	410	390	400	410	430	428	431	410	410	920	440
Total Hardness ($CaCO_3$) (ppm)	360	500	550	485	390	560	490	558	560	583	600	543	535	545	535
CATIONS (ppm)															
Calcium (Ca)	20	80	96	94	58	84	92	98	108	108	104	95	98	100	82
Magnesium (Mg)	75	73	75	61	69	85	63	76	70	76	83	74	70	72	80
Sodium (Na)	134	129	140	128	136	132	140	116	140	128	132	129	140	126	130
Potassium (K)	1.9	1.4	1.7	1.7	1.5	1.7	1.7	1.4	4.0	3.7	3.9	2.7	3.4	4.4	3.3
Ammonia (NH_4)	0.41	0	0.55	0	0	0	0.36	0.36	0.43	0.53	0.49	0.03	0.10	0.14	0.17
ANIONS (ppm)															
Hydroxide (OH)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbonate (CO_3)	24	12	30	18	36	18	24	0	0	0	0	0	12	0	0
Bicarbonate (HCO_3)	244	415	451	415	427	439	439	500	525	522	526	500	476	512	537
Sulfate (SO_4)	376	410	375	376	239	409	356	361	376	434	406	409	388	358	394
Chloride (Cl)	15	10	15	15	20	20	12	7.0	8.4	3.0	8.7	12	9.4	9.4	8.7
Nitrate (NO_3)	3.5	3.5	7.1	13	19	16	9.8	10	20	13	0.89	8.8	6.5	6.8	6.2
Boron (B)	0.03	0.08	0.17	0.17	0.18	0.30	0.19	0.30	0.51	0.21	0.20	0.10	0.19	0.02	0
Silica (SiO_2)	18	17	17	18	16	18	16	13	17	16	17	16.0	15	11	12
Iron (Fe)	0.11	0	0.04	0.14	0.01	0.63	0.18	0.05	0.08	0.15	0.16	0.03	0.06	0.28	0.11
Manganese (Mn)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NUTRIENTS (ppm)															
Ortho Phosphate (PO_4)	0	0	0.05	0.06	0.02	0	0.08	0	0.08	0.07	0	0.11	0.06	0.09	0.03
Nitrite (N)	0.015	0.006	0.008	0	0.023	0.010	0.010	0.008	0	0.02	0.008	0	0.005	0	0.008
Nitrate (N)	0.79	0.79	1.6	2.9	4.3	3.6	2.2	2.3	4.6	3.0	0.26	2.0	1.5	1.5	1.4
Ammonia (N)	0.32	0	0.43	0	0	0	0.28	0.28	0.33	0.41	0.38	0.02	0.08	0.11	0.13
MICROBIOLOGY															
Standard Plate Count/ml at 35°C	1500	110	3200	550,000	230	2500	67,000	410,000	1100	1,700	1,000	110	200	230	3700
Coliform MPN / 100 ml	2400	43	7	1100	9	<3	93	750	< 3	1,100	< 3	9	11000	23	240
Fecal Coliform MPN / 100 ml	4	4	< 3	<3	< 3	<3	< 3	<3	< 3	75	< 3	4	<3	9	<3
Fecal Streptococci MPN / 100 ml	-	<3	< 3	4	< 3	9	280	<3	< 3	< 3	< 3	<3	<3	<3	<3
Pathogens															
SEDIMENT ANALYSIS															
% Moisture								25.0		38.9					
% TKN								0.073	0.16	0.16					
% COD								1.1	4.53	4.0					
% Volatile Solids								2.9		5.3					

Table B-5-1c MONTHLY WATER QUALITY SAMPLE ANALYSES FOR WILLOW CREEK STATIONS

STATION: W-1

Note: ND = Not Detected

CONSTITUENTS	1974					1975						1976			
	Aug	Sep	Oct	Nov	Dec	Jan	Mar	May	Jul	Sep	Nov	Jan	Mar	May	Jul
Temperature (°F)	39°	44°	43°	32°	36°	FROZEN	37°	46°	53°	44.5°	32.8°	32.0°	32.9°	41.9°	
pH	7.1	8.8	8.2	8.2	8.2	OVER	8.0	8.1	8.3	8.5	8.3	9.0	8.28	8.29	8.08
Dissolved Oxygen (mg/l)	8	10	11	15	15		15	8.1	13.2	10.2	15.0	15.0		13.5	
Conductivity (μ mhos/cm)	1325	1300	1375	1075	1440		1450	1450	1600	1500	1450	1050	1500	1500	1500
Total Solids (ppm)	732	924	880	852	860		864	860	840	870	1036	836	848	896	884
Total Alkalinity ($CaCO_3$)(ppm)	265	390	370	350	360		410	415	460	410	390	320	390	405	440
Total Hardness ($CaCO_3$)(ppm)	365	480	360	450	490		470	510	536	520	505	430	470	510	480
CATIONS (ppm)															
Calcium (Ca)	44	68	54	89	96		96	99	124	102	120	89	68	110	76
Magnesium (Mg)	62	75	55	58	61		58	64	59	64	50	51	73	57	70
Sodium (Na)	116	114	156	108	104		120	104	134	114	104	116	120	118	120
Potassium (K)	2.3	1.5	1.9	1.4	1.4		1.5	1.1	4.0	3.4	2.5	2.1	2.6	5.2	3.8
Ammonia (NH_4)	0	0	0.52	0.13	0		0.34	0.49	0.30	0	0.13	0.06	0.21	0.19	0.01
ANIONS (ppm)															
Hydroxide (OH)	0	0	0	0	0		0	0	0	0	0	0	0	0	0
Carbonate (CO_3)	18	12	24	12	6.0		0	12	36	0	12	0	12	0	42
Bicarbonate (HCO_3)	287	451	403	403	427		500	482	488	500	451	390	459	494	451
Sulfate (SO_4)	315	365	266	313	326		270	289	318	322	325	318	295	327	322
Chloride (Cl)	25	15	30	15	20		15	10	12	10	14	10	10	13	11
Nitrate (NO_3)	0.75	1.7	2.0	2.4	2.8		3.8	2.0	0.18	0.60	2.6	3.8	2.6	2.3	1.6
Boron (B)	0	0.13	0.67	0.08	0.18		0.27	0.27	0.20	0.04	0.14	0.22	0	0.12	0
Silica (SiO_2)	18	19	17	16	17		18	10	15	18	15	16	17	15	16
Iron (Fe)	0.02	0	0.31	0.94	0.11		0.63	0.13	0.14	0.02	0.05	0.10	0.88	0.57	3.3
Manganese (Mn)	0	0	0	0	0		0	0	0	0	0	0	0	0	0
NUTRIENTS (ppm)															
Ortho Phosphate (PO_4)	0.05	0.22	0	0	0		0.06	0	0	0.03	0	0.02	0.12	0.13	0.05
Nitrite (N)	0.005	0.006	0	0.008	0.005		0	0.008	0	0.003	0.008	0	0.023	0	0.008
Nitrate (N)	0.17	0.37	0.46	0.55	0.62		0.86	0.45	0.04	0.14	0.58	0.85	0.58	0.52	0.37
Ammonia (N)	0	0	0.40	0.10	0		0.27	0.39	0.23	0	0.10	0.05	0.16	0.15	0.01
MICROBIOLOGY															
Standard Plate Count/ml at 35°C	340	1300	*TNTC	200,000	710,000		63,000	24,000	19,000	2,400	14,000	1400	1500	22000	4300
Coliform MPN/100ml	4600	4600	1100	1100	750		4600	4600	>24,000	11,000	460	460	1100	<24000	11000
Fecal Coliform MPN/100ml	93	< 3	< 3	23	< 3		240	< 3	750	3	4	43	93	4600	43
Fecal Streptococci MPN/100ml	-	< 3	240	43	21		1500	< 3	150	9	< 3	4	<3	150	93
Pathogens		ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND
SEDIMENT ANALYSIS															
% Moisture								37.0		44.7					
% TKN								0.16	0.029	0.15					
% COD								2.2	0.62	3.4					
% Volatile Solids								2.8		5.7					

*Too numerous to count

Table B-5-1c (Continued)

STATION : W-2

Note: ND = Not Detected

CONSTITUENTS	1974					1975						1976			
	Aug	Sep	Oct	Nov	Dec	Jan	Mar	May	Jul	Sep	Nov	Jan	Mar	May	Jul
Temperature (°F)	54°	48°	49°	38°	38°	FROZEN	37°	46°	52°	47°	34°	30.2°	33.8	43.2	
pH	6.9	8.8	8.2	5.5	8.2	OVER	3.3	8.3	8.3	8.5	8.3	9.0	8.17	8.78	8.05
Dissolved Oxygen (mg/l)	8	10.0	10.0	15	15		15	11	10	15.0	15.0	15.0	15.0	10.8	
Conductivity (μ mhos/cm)	1350	1475	1400	1550	1590		1330	1500	1680	1500	1600	1400	1540	1520	1700
Total Solids (ppm)	820	880	944	940	932		916	892	930	890	876	864	908	972	924
Total Alkalinity (CaCO$_3$)(ppm)	300	350	380	390	420		360	430	480	400	440	330	415	390	450
Total Hardness (CaCO$_3$)(ppm)	400	480	500	500	530		415	526	580	490	545	425	500	510	550
CATIONS (ppm)															
Calcium (Ca)	42	69	76	88	110		76	94	128	106	92	89	84	96	78
Magnesium (Mg)	72	75	75	68	62		55	71	63	55	77	49	70	66	94
Sodium (Na)	140	128	132	128	120		116	112	142	120	116	122	122	120	128
Potassium (K)	2.2	1.7	2.0	1.7	1.4		1.7	1.2	4.0	3.5	2.8	2.3	3.0	4.2	3.8
Ammonia (NH$_4$)	0.23	0	0.47	0.14	0		0.39	0.24	0.36	0	0.36	0.05	0.19	0.19	0.09
ANIONS (ppm)															
Hydroxide (OH)	0	0	0	0	0		0	0	0	0	0	0	0	0	0
Carbonate (CO$_3$)	30	12	18	18	12		12	12	12	0	12	18	12	0	42
Bicarbonate (HCO$_3$)	305	403	427	439	488		415	500	561	488	512	403	482	476	464
Sulfate (SO$_4$)	366	348	361	334	339		259	302	328	325	347	355	327	337	365
Chloride (Cl)	20	20	20	20	20		11	10	11	10	19	12	10	11	10
Nitrate (NO$_3$)	0.64	0.62	1.3	1.5	1.5		2.0	0.86	0.71	2.9	1.1	1.9	2.0	1.7	0.54
Boron (B)	0	0.17	0.17	0.02	0.18		0.16	0.33	0.29	0.10	0.24	0.14	0	0	0
Silica (SiO$_2$)	17	18	19	19	17		16	9.6	18	17	15	18	16	14	14
Iron (Fe)	0.04	0	0.12	0.72	0.54		0.90	4.5	0.37	0.80	0.74	0.18	0.88	1.3	1.5
Manganese (Mn)	0	0	0	0	0		0	0	0	0	0	0	0	0	0
NUTRIENTS (ppm)															
Ortho Phosphate (PO$_4$)	0.04	0.02	0.02	0	0.04			0	0.04	0.05	0	0.01	0.10	0.09	0.04
Nitrite (N)	0.006	0.015	0	0	0.01		0.017	0	0	0.005	0.005	0	0.014	0	0.005
Nitrate (N)	0.14	0.14	0.30	0.33	0.34		0.46	0.19	0.16	0.66	0.26	0.43	0.45	0.37	0.12
Ammonia (N)	0.18	-	0.37	0.11	0		0.30	0.19	0.28	0	0.28	0.04	0.14	0.15	0.07
MICROBIOLOGY															
Standard Plate Count/ml at 35°C	95	460	13,000	320,000	19,000		53,000	65,000	150,000	56,000	4,200	1400	1800	8900	4000
Coliform MPN/100ml	240	1200	460	>24,000	4600		4600	>24,000	24,000	4,600	460	240	460	2400	4600
Fecal Coliform MPN/100ml	23	< 3	< 3	< 3	< 3		240	460	93	23	4	9	15	460	460
Fecal Streptococci MPN/100ml	-	< 3	150	240	23		240	28	210	240	15	<3	<3	93	93
Pathogens															
SEDIMENT ANALYSIS															
% Moisture								20.7							
% TKN								0.024	0.025						
% COD								0.36	0.49						
% Volatile Solids								2.0							

Table B-5-1c (Continued)

STATION : W-3

Note ND = Not Detected

CONSTITUENTS	1974					1975						1976			
	Aug	Sep	Oct	Nov	Dec	Jan	Mar	May	Jul	Sep	Nov	Jan	Mar	May	Jul
Temperature (°F)	54°	48°	50°	43°	37°	36°	37°	46°	52°	46°	34°	32°	35.6	46.9	
pH	6.7	8.8	8.0	5.5	8.2	8.3	8.2	8.1	8.2	8.3	8.3	8.3	8.29	8.24	8.0
Dissolved Oxygen (mg/l)	8	9.0	10	15	15	15	15	13.3	12.6	15.0	15.0	15.0	15.0	11.6	
Conductivity (μ mhos/cm)	1425	1500	14.75	1700	1670	525	1550	1750	1800	1700	1600	1425	1550	1750	1800
Total Solids (ppm)	792	740	976	1032	964	1024	972	1064	940	1120	916	952	896	1012	1012
Total Alkalinity ($CaCO_3$)(ppm)	295	310	405	430	410	435	410	490	495	450	450	325	410	460	500
Total Hardness ($CaCO_3$)(ppm)	390	410	520	535	530	580	500	616	600	550	500	470	505	580	580
CATIONS (ppm)															
Calcium (Ca)	28	62	76	98	116	112	84	102	112	98	98	80	104	120	88
Magnesium (Mg)	73	62	80	70	58	73	70	88	78	74	62	66	60	68	87
Sodium (Na)	144	108	114	140	132	126	128	132	148	140	136	125	124	140	148
Potassium (K)	2.5	1.1	2.0	2.2	1.9	2.0	1.9	1.5	4.6	4.0	2.9	2.7	3.3	5.3	3.8
Ammonia (NH_4)	0	0	1.5	0.12	0	0.22	0.49	0.41	0.36	0.03	0.34	0.06	0.25	0.15	0.16
ANIONS (ppm)															
Hydroxide (OH)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbonate (CO_3)	24	12	18	12	12	24	0	0	0	0	12	0	18	0	18
Bicarbonate (HCO_3)	311	354	458	500	476	482	500	591	604	549	525	397	464	561	573
Sulfate (SO_4)	375	300	380	382	382	382	321	358	368	360	355	363	330	371	391
Chloride (Cl)	20	15	20	20	20	25	10	13	12	14	19	12	10	13	13
Nitrate (NO_3)	1.9	0.84	1.9	3.4	2.1	2.8	2.4	3.5	3.0	3.6	1.4	2.5	2.0	1.7	2.3
Boron (B)	0.13	0.13	0.08	0.08	0.18	0.20	0.37	0.33	0.27	0.17	0.40	0.18	0.07	0	0
Silica (SiO_2)	18	18	18	31	19	19	17	17	19	17	16	19	16	13	14
Iron (Fe)	0.02	0	0.16	0.31	2.7	1.6	6.4	0.41	0.15	0.38	0.78	3.4	4.0	0.01	0.25
Manganese (Mn)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NUTRIENTS (ppm)															
Ortho Phosphate (PO_4)	0.05	0	0.03	0.11	0.16	0.02	0.06	0	0.09	0.06	0	0.01	0.15	0.08	0.04
Nitrite (N)	0.003	0.005	0	0.005	0	0.010	0	0.012	0.005	0.005	0.005	0	0.028	0	0
Nitrate (N)	0.43	0.19	0.43	0.77	0.48	0.64	0.54	0.80	0.67	0.81	0.31	0.56	0.45	0.39	0.51
Ammonia (N)	0	0	1.2	0.09	0	0.17	2.4	0.32	0.28	0.02	0.26	0.05	0.19	0.12	0.12
MICROBIOLOGY															
Standard Plate Count/ml at 35°C	2200	520	69,000	360,000	26,000	130,000	25,000	63,000	28,000	30,000	16,000	810	5200	2300	3500
Coliform MPN/100ml	320	24,000	2,400	2400	1500	750	2400	11,000	2400	11,000	390	460	2400	2400	2400
Fecal Coliform MPN/100ml	43	< 3	< 3	93	7	9	240	< 3	210	93	9	7	1100	23	93
Fecal Streptococci MPN/100ml	-	< 3	21	43	750	240	1500	240	2400	93	15	7	9	4	1100
Pathogens															
SEDIMENT ANALYSIS															
% Moisture								27.1		25.9					
% TKN								0.081	0.041	0.061					
% COD								1.3	0.54	1.2					
% Volatile Solids								2.3		3.2					

Table B-5-1c (Continued)

STATION : UWL

Note. ND = Not Detected

CONSTITUENTS	1974					1975						1976			
	Aug	Sep	Oct	Nov	Dec	Jan	Mar	May	Jul	Sep	Nov	Jan	Mar	May	Jul
Temperature (°F)	57°	52°	48°	39°	-	36°	42°	49°	50°	43°	41°	35.6°	46.4	42.8	
pH	7.0	8.9	7.8	5.6	8.1	8.2	8.2	7.8	8.2	8.1	8.3	8.6	7.85	7.95	7.91
Dissolved Oxygen (mg/l)	5	12.0	10.0	15.0	15	15	11	8.8	15.0	10.4	15.0	13.0	15.0	9.2	
Conductivity (μ mhos/cm)	1375	1600	1375	2000	1600	160	1500	920	1580	1650	1700	1150	1580	1600	1600
Total Solids (ppm)	796	800	908	936	904	960	984	924	820	920	916	916	936	888	992
Total Alkalinity ($CaCO_3$)(ppm)	300	380	400	410	440	375	420	470	460	470	470	460	440	445	450
Total Hardness ($CaCO_3$)(ppm)	400	450	510	520	545	485	495	580	550	550	590	530	535	540	555
CATIONS (ppm)															
Calcium (Ca)	38	84	92	90	112	92	88	108	120	115	108	106	114	120	108
Magnesium (Mg)	74	58	68	72	64	62	67	51	61	64	78	64	61	58	60
Sodium (Na)	126	128	128	120	116	117	120	116	118	120	116	120	120	120	120
Potassium (K)	1.5	0.9	1.5	1.5	1.4	1.7	1.5	1.4	2.7	2.9	2.9	2.4	2.7	3.7	2.5
Ammonia (NH_4)	0	0	0.28	0	0	0.23	0.34	0.27	0.55	0.42	0.33	0.03	0.07	0.13	0
ANIONS (ppm)															
Hydroxide (OH)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbonate (CO_3)	60	12	18	24	0	12	24	0	0	0	0	0	12	0	0
Bicarbonate (HCO_3)	244	439	451	451	537	433	464	573	561	573	573	561	512	543	549
Sulfate (SO_4)	331	305	330	325	330	338	294	300	308	337	348	300	294	312	335
Chloride (Cl)	20	10	70	15	15	25	10	9.0	9.8	9.0	13	12	10	11	8.7
Nitrate (NO_3)	0.84	0.67	0.84	1.6	1.7	2.1	2.0	0.41	1.3	1.3	2.0	1.9	2.3	1.6	1.1
Boron (B)	0.25	0.08	0.17	0.08	0.02	0.20	0.12	0.69	0.49	0.10	0.014	0.12	0	0	0
Silica (SiO_2)	18	17	18	20	16	19	17	12	16	16	16	17	16	13	15
Iron (Fe)	0.11	0	0.008	0.07	0.21	0.38	0.15	0.03	0.08	0.08	0.07	0.15	0	0.07	0.25
Manganese (Mn)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NUTRIENTS (ppm)															
Ortho Phosphate (PO_4)	0	0	0.02	0.06	0	0.07	0.04	0	0.02	0.02	0	0.03	0.12	0.12	0.03
Nitrite (N)	0.015	0.005	0	0	0.005	0.014	0	0.008	0.005	0.005	0.014	0	0	0	0
Nitrate (N)	0.19	0.15	0.19	0.36	0.32	0.48	0.46	0.41	0.30	0.30	0.45	0.43	0.53	0.36	0.24
Ammonia (N)	0	0	-	0	0	0.18	0.26	0.21	0.43	0.33	0.26	0.02	0.05	0.10	0
MICROBIOLOGY															
Standard Plate Count/ml at 35°C	340	110	7,700	1,000,000	1000,000	95,000	4,200	9,400	200,000	16,000	5,700	790	120	1200	950
Coliform MPN/100ml	150	23	23	75	240	75	4600	460	150	1,100	1,100	24	460	39	240
Fecal Coliform MPN/100ml	93	< 3	< 3	< 3	< 3	4	240	< 3	75	4	< 3	<3	<3	9	43
Fecal Streptococci MPN/100ml	-	< 3	< 3	9	93	43	43	< 3	1500	4	< 3	<3	<3	< 3	15
Pathogens															
SEDIMENT ANALYSIS															
% Moisture								62.6		52.2					
% TKN								0.33	0.14	0.27					
% COD								5.1	2.81	5.3					
% Volatile Solids								5.1		7.7					

Table B-5-1c (Concluded)

STATION: LWL

Note ND = Not Detected

CONSTITUENTS	1974					1975						1976			
	Aug	Sep	Oct	Nov	Dec	Jan	Mar	May	Jul	Sep	Nov	Jan	Mar	May	Jul
Temperature (°F)			46°	45°		41°	46°	48°	53°	43.5°	43.5°	41.0°	47.3	45.5	
pH			7.8	5.6		8.2	8.3	7.5	8.0	8.0	8.3	8.2	7.95	7.71	7.67
Dissolved Oxygen (mg/l)			5.0	15	15	15	12	8.2	13.4	15.0	12.5	15	15.0	9.1	
Conductivity (μ mhos/cm)			1450	1600	1730	1700	1600	1680	1740	1750	1750	1400	1680	1700	1750
Total Solids (ppm)			988	992		984	1028	1012	850	900	940	968	976	1108	1016
Total Alkalinity ($CaCO_3$)(ppm)			450	465		445	450	490	490	495	500	443	450	470	500
Total Hardness ($CaCO_3$)(ppm)			560	520		470	510	580	600	603	600	533	545	580	610
CATIONS (ppm)															
Calcium (Ca)			98	108		106	98	108	120	112	140	120	108	120	120
Magnesium (Mg)			77	61		50	64	75	73	79	49	57	67	68	75
Sodium (Na)			140	132		132	132	120	135	128	124	127	142	132	128
Potassium (K)			1.5	1.4		1.5	1.5	1.1	3.2	3.0	3.2	2.5	2.9	4.0	2.9
Ammonia (NH_4)			0.51	0.10		0.05	0.01	0.16	0.36	0.05	0.49	0.01	0.05	0.09	0.10
ANIONS (ppm)															
Hydroxide (OH)			0	0		0	0	0	0	0	0	0	0	0	0
Carbonate (CO_3)			24	6		18	24	0	0	0	0	0	18	0	0
Bicarbonate (HCO_3)			500	488		506	500	598	598	604	610	540	512	573	610
Sulfate (SO_4)			360	351		363	308	335	348	361	355	347	353	351	360
Chloride (Cl)			15	15		25	10	10	10	4.0	12	12	12	10	9.6
Nitrate (NO_3)			0.19	1.5		1.6	1.8	1.4	1.4	1.7	1.6	1.8	1.4	1.4	1.2
Boron (B)			0.17	0.08		0.20	0.22	0.17	0.37	0.19	0.2	0.06	0	0.02	0
Silica (SiO_2)			21	21		20	20	16	19	19	19	19	18	15	15
Iron (Fe)			0.03	0.12		0.21	0.08	0.06	0.08	0.36	0.67	0.05	0	0.21	0.11
Manganese (Mn)			0	0		0	0	0	0	0	0	0	0	0	0
NUTRIENTS (ppm)															
Ortho Phosphate (PO_4)			0.03	0.07		0.14	0.11	1.9	0.08	0.09	0	0.14	0.11	0.11	0.03
Nitrite (N)			0.005	0		0.005	0.020	0.005	0	0.005	0.008	0	0	0	0
Nitrate (N)			0.19	0.34		0.36	0.41	0.32	0.32	0.39	0.36	0.40	0.33	0.32	0.28
Ammonia (N)			0.39	0.08		0.04	0.01	0.12	0.28	0.04	0.38	0.01	0.04	0.07	0.08
MICROBIOLOGY															
Standard Plate Count/ml at 35°C			2,300	39,000	110,000	97,000	200,000	520,000	4700	620	270	65	15	230	400
Coliform MPN/100ml			< 3	< 3	9	110	4	23	< 3	460	< 3	23	4600	23	150
Fecal Coliform MPN/100ml			< 3	< 3	< 3	< 3	< 3	< 3	< 3	4	< 3	<3	<3	9	<3
Fecal Streptococci MPN/100ml			< 3	< 3	< 3	15	200	< 3	< 3	4	< 3	9	<3	23	<3
Pathogens															
SEDIMENT ANALYSIS															
% Moisture								22.7		28.4					
% TKN								0.037	0.035	0.068					
% COD								0.75	0.72	2.9					
% Volatile Solids								2.3		3.5					

Table B-5-1d MONTHLY WATER QUALITY SAMPLE ANALYSES FOR WHITE RIVER STATIONS

STATION: WR-1

Note ND = Not Detected

CONSTITUENTS	1974					1975						1976			
	Aug	Sep	Oct	Nov	Dec	Jan	Mar	May	Jul	Sep	Nov	Jan	Mar	May	Jul
Temperature (°F)	61°	51°	43°	32°	32°	32°	36°	50°	61°	53.5°	32°	FROZEN	30.2	44.6	
pH	7.8	8.8	8.0	8.0	8.0	8.2	8.3	7.5	8.0	8.6	8.2	OVER	8.04	7.97	8.14
Dissolved Oxygen (mg/l)	0	9.0	10.0	15	15	15	15	8.7	10.8	9.3	15.0		15.0	4.2	
Conductivity (μ mhos/cm)	750	820	720	1975	870	720	750	330	430	800	630		730	400	950
Total Solids (ppm)	512	472	468	480	488	404	472	176	275	480	436		484	264	628
Total Alkalinity ($CaCO_3$)(ppm)	210	200	185	100	195	145	160	95	130	190	140		140	110	210
Total Hardness ($CaCO_3$)(ppm)	335	310	280	280	300	270	280	140	180	308	250		239	170	360
CATIONS (ppm)															
Calcium (Ca)	116	88	76	72	74	72	80	40	52	86	68		55	48	88
Magnesium (Mg)	11	22	22	24	28	22	19	9.7	12	23	18		25	12	34
Sodium (Na)	59	49	54	57	57	39	47	11	22	37	35		54	15	54
Potassium (K)	2.2	1.5	1.7	1.5	1.5	1.7	1.9	1.5	1.7	34	2.0		2.0	1.4	3.5
Ammonia (NH_4)	0.18	0	0	0	0	0	0.01	0.08	0.33	0.45	0.08		0.17	0.17	0.26
ANIONS (ppm)															
Hydroxide (OH)	0	0	0	0	0	0	0	0	0	0	0		0	0	0
Carbonate (CO_3)	6	18	0	12	0	6.0	0	0	0	0	0		0	0	30
Bicarbonate (HCO_3)	244	207	226	229	238	165	195	116	159	232	171		171	138	195
Sulfate (SO_4)	153	153	162	150	157	140	138	39	58	162	134		162	66	203
Chloride (Cl)	59	30	40	40	45	4	49	9.0	12	33	48		38	18	36
Nitrate (NO_3)	0	0.04	0.03	0.93	1.2	1.2	0.22	1.3	0.23	0.31	0.15		0.31	0.61	0.49
Boron (B)	0.13	0.08	0	0.17	0	0.20	0.18	0.90	0.24	0.10	0.18		0.17	0	0
Silica (SiO_2)	16	14	15	16	15	18	17	13	15	17	15		14	9.6	15
Iron (Fe)	0.16	0.35	0.36	0.66	0.07	0.19	0.94	11	1.4	1.5	0.19		0.49	4.4	6.6
Manganese (Mn)	0	0	0	0	0	0	0	0	0	0	0		0	0	0
NUTRIENTS (ppm)															
Ortho Phosphate (PO_4)	0	0	0	0	0.12	0	0.08	0	0.075	0.12	0		0.06	0.09	0.08
Nitrite (N)	0	0.001	0	0.014	0.005	0.014	0	0	0	0.014	0		0.017	0	0.014
Nitrate (N)	0	0.01	0.006	0.21	0.28	0.26	0.05	0.30	0.05	0.07	0.03		0.07	0.14	0.11
Ammonia (N)	0.14	0	0	0	0	0	0.01	0.06	0.25	0.35	0.06		0.13	0.13	0.20
MICROBIOLOGY															
Standard Plate Count/ml at 35°C	840	2000	6200	52,000	21,000	4000	22,000	220,000	15,000	25,000	3,700		5000	14,000	9700
Coliform MPN/100 ml	750	460	11,000	240	11,000	1100	2400	>24,000	1500	24,000	2,100		11,000	1100	11000
Fecal Coliform MPN/100 ml	460	< 3	< 3	2100	460	93	23	< 3	240	460	240		2100	1100	460
Fecal Streptococci MPN/100 ml	-	< 3	9	23	240	43	240	< 3	240	150	15		240	93	75
Pathogens									ND	ND	ND		N.D.	N.D.	ND
SEDIMENT ANALYSIS															
% Moisture								24.9		20.3					
% TKN								0.059	0.039	0.026					
% COD								0.92	1.06	0.74					
% Volatile Solids								1.9		1.3					

Table B-5-1d (Concluded)

STATION: WR-2

Note ND = Not Detected

CONSTITUENTS	1974					1975						1976			
	Aug	Sep	Oct	Nov	Dec	Jan	Mar	May	Jul	Sep	Nov	Jan	Mar	May	Jul
Temperature (°F)	59°	51°	43°	32°	32°	32°	36°	47°	59°	53.5°	32°	FROZEN	30.2	45.5	
pH	7.4	8.8	8.0	8.0	8.0	8.3	8.5	7.1	8.0	8.6	8.3	OVER	8.08	7.95	7.85
Dissolved Oxygen (mg/l)	8	10.0	10.0	15.0	15.0	15.0	15.0	8.6	9.8	9.4	15.0		15.0	6.0	
Conductivity (μ mhos/cm)	675	740	700	1775	690	200	900	370	460	900	760		900	450	1050
Total Solids (ppm)	424	440	462	408	404	452	556	240	270	515	456		552	296	712
Total Alkalinity ($CaCO_3$)(ppm)	160	180	150	140	140	180	210	118	150	230	190		200	130	250
Total Hardness ($CaCO_3$)(ppm)	265	300	270	250	270	275	295	157	190	318	265		284	188	340
CATIONS (ppm)															
Calcium (Ca)	74	88	74	68	74	72	84	42	52	83	72		70	53	92
Magnesium (Mg)	19	22	21	19	21	23	21	12	15	27	21		26	13	27
Sodium (Na)	35	35	35	34	35	57	71	16	29	61	53		76	19	68
Potassium (K)	1.9	1.2	1.9	1.4	1.2	1.7	2.0	1.5	2.2	36	2.3		2.5	1.5	3.5
Ammonia (NH_4)	0.13	0	0	0	0	0.10	0.12	0	0.35	0.15	0.05		0.24	0.18	0.04
ANIONS (ppm)															
Hydroxide (OH)	0	0	0	0	0	0	0	0	0	0	0		0	0	0
Carbonate (CO_3)	12	12	0	12	0	12	18	0	0	12	0		0	0	0
Bicarbonate (HCO_3)	171	195	183	146	171	195	256	144	183	256	232		244	159	305
Sulfate (SO_4)	143	130	147	135	135	153	165	39	66	182	157		190	71	224
Chloride (Cl)	39	35	35	40	45	43	40	9.0	13	30	29		36	21	35
Nitrate (NO_3)	0	0.18	0	0.18	1.1	1.3	0.27	1.3	0.13	0.76	0.40		0.44	0.59	0.04
Boron (B)	0	0	0	0.17	0	0.20	0.26	1.6	0.29	0.44	0.34		0.07	0	0
Silica (SiO_2)	15	14	16	16	16	18	16	12	15	15	16		14	9.9	16
Iron (Fe)	0.31	0.49	0.44	0.36	0.05	0.31	2.2	12	1.3	3.9	0.94		1.8	4.3	0.50
Manganese (Mn)	0	0	0	0	0	0	0	0	0	0	0		0	0	0
NUTRIENTS (ppm)															
Ortho Phosphate (PO_4)	0	0	0.07	0	0.04	0	0.04	0	0.08	0.12	0		0.10	0.08	0.04
Nitrite (N)	0	0.003	0	0	0.005	0.010	0	0.062	0	0.017	0		0.028	0	0
Nitrate (N)	0	0.004	0	0.004	0126	0.29	0.06	0.30	0.13	0.17	0.09		0.10	0.13	0.01
Ammonia (N)	0.14	0	0	0	0	0.08	0.09	0	0.27	0.12	0.04		0.19	0.14	0.03
MICROBIOLOGY															
Standard Plate Count/ml at 35°C	990	1700	3700	54,000	6600	5400	-	34,000	140,000	21,000	40,000		5100	8800	2000
Coliform MPN/100 ml	2400	> 24,000	4600	1500	1500	75	-	11,000	2400	24,000	210		11,000	4600	2400
Fecal Coliform MPN/100 ml	240	< 3	< 3	240	390	75	-	< 3	93	460	43		1100	460	93
Fecal Streptococci MPN/100 ml	-	< 3	23	9	93	43	-	23	93	93	23		43	43	210
Pathogens	-	ND	ND	ND	ND	ND	-	ND							
SEDIMENT ANALYSIS															
% Moisture								29.5							
% TKN								0.037	0.017						
% COD								0.61	0.47						
% Volatile Solids								1.8							

Table B-5-2 HEAVY METAL SPECTROGRAPHIC SCREEN ANALYSIS FOR SELECTED SEDIMENT SAMPLES FROM PICEANCE BASIN, JULY 1975

	Stations			
Metals	P-1	P-7	LSL	LWL
Silicon	7.10%	7.20%	6.55%	6.10%
Manganese	0.28	0.30	0.18	0.15
Chromium	0.035	0.025	0.050	0.020
Nickel	0.010	0.005	0.010	0.008
Boron	0.020	0.015	0.010	0.015
Lead	0.005	0.001	0.003	0.005
Magnesium	0.003	0.010	0.005	0.005
Copper	0.015	0.015	0.025	0.010
Titanium	0.015	0.010	0.020	0.020
Aluminum	2.85	3.50	3.10	2.58
Potassium	0.020	0.015	0.010	0.015
Calcium	0.43	0.55	0.35	0.30
Sodium	0.080	0.085	0.080	0.75
Iron	Remainder	Remainder	Remainder	Remainder

Station Legend

P-1, P-7 - Piceance Creek

L.S.L. - Lower Stewart Lake

L.W.L. - Lower Willow Lake

Table B-5-3 LIGHT AND DARK BOTTLE DISSOLVED OXYGEN DETERMINATIONS FOR UPPER AND LOWER STEWART AND WILLOW LAKES FROM JULY 1975 TO JULY 1976

LAKE STATION	1975 JULY 8 Hr* 24 Hr**						1975 SEPTEMBER 24 Hr						1975 NOVEMBER 22 Hr					
	Initial		Light		Dark		Initial		Light		Dark		Initial		Light		Dark	
	Rep.	Avr.	Rep.	Avr.	Rep.	Avr.	Rep.	Avr.	Rep	vr.	Rep.	Avr	Rep.	Avr.	Rep.	vr.	Rep.	Avr.
Upper Stewart Lake	8.96		8.96		8.82		8.45		7.60		8.03							
	8.82	8.89	9.38	* 9.17	8.54	* 8.68	8.17	8.31	7.04	7.32	7.04	7.54						
			8.68		8.68													
			8.96	** 8.82	8.96	** 8.82												
Lower Stewart Lake	4.62		4.76		4.76		6.05		6.05		5.77		5.00		4.93		4.79	
	4.55	4.59	4.62	* 4.69	3.50	* 4.13	5.63	5.84	5.91	5.98	5.91	5.84	4.86	4.93	4.93	4.93	4.79	4.79
			4.90		4.62													
			4.90	** 4.90	4.76	** 4.69												
Upper Willow Lake	7.28		7.70		7.70		6.26		6.62		6.45		8.31		8.31		8.45	
	8.26	7.77	7.28	* 7.49	-	* 7.70	6.62	6.44	6.19	6.41	6.34	6.40	8.59	8.45	8.52	8.42	7.46	7.95
			7.42		6.44													
			7.70	** 7.56	6.86	** 6.65												
Lower Willow Lake	3.99		4.06		3.50		3.63		3.24		3.38		3.24		3.38		3.66	
	3.50	3.75	4.34	* 4.20	-	* 3.50	3.17	3.40	3.24	3.24	3.38	3.38	3.66	3.45	3.66	3.52	3.66	3.66
			4.20		3.36													
			4.06	** 4.13	-	** 3.36												

Table B-5-3 (Concluded)

LAKE STATIONS	1976 JANUARY 8 Hr						1976 MARCH 24 Hr						1976 MAY 21 Hr* 22 Hr**						1976 JULY 22 Hr					
	Initial		Light		Dark		Initial		Light		Dark		Initial		Light		Dark		Initial		Light		Dark	
	Rep.	Avr.	Rep	vr.	Rep.	Avr.	Rep.	Avr.	Rep.	.vr.	Rep.	Avr.	Rep.	Avr.	Rep.	vr.	Rep.	Avr.	Rep.	Avr.	Rep.	vr.	Rep.	Avr.
Upper Stewart Lake													7.03		7.52		5.34							
													7.17	7.10	7.52	* 7.52	6.81	* 6.08						
Lower Stewart Lake	4.99		4.92		4.92		4.78		4.57		4.64		5.41		5.90		5.48		6.30		6.30		5.46	
	4.99	4.99	4.92	4.92	4.92	4.92	4.64	4.71	4.71	4.64	4.71	4.68	5.62	5.52	6.04	* 5.97	5.34	* 5.41	6.30	6.30	6.30	6.30	5.88	5.67
Upper Willow Lake	4.50		4.57		4.43		5.55		5.41		5.41		6.60		6.74		6.46		8.12		8.26		8.12	
	4.57	4.53	5.28	4.93	4.36	4.39	5.34	5.45	5.34	5.38	5.48	5.45	6.53	6.57	6.60	** 6.67	6.53	** 6.49	8.40	8.26	7.56	7.91	7.84	7.98
Lower Willow Lake	2.88		2.81		2.60		3.30		3.44		3.44		5.76		6.18		** 6.39		4.60		5.04		4.20	
	-	2.88	2.88	2.85	2.81	2.71	3.37	3.34	3.37	3.91	3.23	3.34	6.04	5.90	6.67	** 6.43	6.40	6.22	4.62	4.61	4.62	4.83	4.62	4.41

Rep = Replicate Sample Values

Ave = Average of Replicates

[1] Computed by Modified Winkler Method, Results in mg/l.

Table B-5-4 TAXONOMIC LIST OF AQUATIC VEGETATION COLLECTED FROM PICEANCE CREEK, STEWART CREEK, WILLOW CREEK AND THE WHITE RIVER

Scientific Name	Common Name
Chlorophyceae	Green Algae
Actinastrum sp.	
Cladophora sp.	
Chaetophora sp.	
Closterium sp.	
Closterium liebleinii	
Closterium lunula	
Closterium gracilis	
Cosmarium sp.	
Enteromorpha sp.	
Microspora sp.	
Pediastrum sp.	
Protococcus sp.	
Protococcus viridis	
Protoderma viride	
Scenedesmus sp.	
Spirogrya sp.	
Stigoclonium sp.	
Ulothrix sp.	
Ulothrix zonata	
Vaucheria sp.	
Zygnema sp.	
Draparnaldia sp.	
Unidentified Zygnemataceaen	
Unidentified Green Coccoid	
Bacillariophyceae	Diatoms
Achnanthes sp.	
Achnanthes lanceolata	
Achnanthes lanceolata var. *Dubia*	
Amphora sp.	
Amphora ovalis	
Amphiprora ornata	
Asterionella sp.	
Caloneis sp.	
Caloneis amphisbaena	
Caloneis silicula	
Ceratoneis sp.	
Cocconeis sp.	
Cocconeis placentula	
Cymbella sp.	
Cymbella affinis	

Table B-5-4 (Continued)

Scientific Name	Common Name
Cymbella ventricosa	
Cymbella tumida	
Cyclotella sp.	
Cyclotella meneghiniana	
Cymatopleura sp.	
Cymatopleura solea	
Depolneis sp.	
Diatoma sp.	
Diatoma vulgare	
Diatoma tenua var. *Elongatum*	
Eunotia sp.	
Eunotia pectinalis	
Fragilaria sp.	
Fragilaria crotonensis	
Fragilaria construens	
Frustulia sp.	
Gomphoneis sp.	
Gomphonema sp.	
Gomphonema olivaceum	
Gomphonema constructum	
Gyrosigma sp.	
Gyrosigna acuminatum	
Hannaea arcus	
Melosira sp.	
Meridion sp.	
Meridion circulare	
Navicula sp.	
Navicula cryptocephala	
Navicula rhynchocephala	
Navicula viridula	
Nedium sp.	
Nitzschia sp.	
Nitzschia gracilis	
Nitzschia sigmoidea	
Nitzschia acicularis	
Nitzschia palea	
Nitzschia paleacea	
Pinnularia viridis	
Rhoicosphenia sp.	
Rhoicosphenia curvata	
Rhopaladia sp.	
Stauroneis sp.	
Stephanodiscus hantzschii	

Table B-5-4 (Concluded)

Scientific Name	Common Name
Surirella sp.	
Surirella ovata	
Synedra sp.	
Synedra ulna	
Synedra ulna var. *Impressa*	
Synedra rupens	
Tabellaria sp.	
Cyanophyta	Blue-green algae
Agmenellum sp.	
Anabaena sp.	
Lyngbya sp.	
Lyngbya spirulinoidea	
Nodularia sp.	
Oscillatoria sp.	
Oscillatoria limnetica	
Oscillatoria limosa	
Phormidium sp.	
Euglenophyceae	Euglenids
Euglena acus	
Tracheophyta	Vascular plants
Mimulus sp.	Monkey-flower
Najas sp.	Water-nymph
Potamogeton sp.	Pondweed
Ranunculus sp.	Buttercup
Rorippa sp.	Watercress

Table B-5-5 PERIPHYTON SPECIES COLLECTED FROM PICEANCE BASIN STATIONS FROM AUGUST 1974 - JULY 1976

Station

P-1 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
CHLOROPHYCEAE															
Actinastrum sp.				X											
Cladophora sp.															
Chaetophora sp.															
Closterium sp.			X												
Closterium liebleinii															
Closterium lunula															
Closterium gracilis															
Cosmarium sp.															
Enteromorpha sp.															
Microspora sp.															
Pediastrum sp.															
Protococcus sp.															
Protococcus viridis															
Protoderma viride										X					
Scenedesmus sp.															
Spirogyra sp.															
Stigoclonium sp.															
Ulothrix sp.															
Ulothrix zonata									X						
Vaucheria sp.					X										
Zygnema sp.															
Draparnaldia sp.															
Unidentified Zygnemataceaen															
Unidentified Green Coccoid															
BACILLARIOPHYCEAL															
Achnanthes sp.															
Achnanthes lanceolata										X	X				
Achnanthes lanceolata var. *Dubia*															
Amphora sp.		X		X	X										
Amphora ovalis									X	X					
Amphiphora ornata															
Asterionella sp.															
Caloneis sp.			X	X	X										
Caloneis amphisbaena									X						
Caloneis silicula									X						
Ceratoneis sp.															
Cocconeis sp.		X	X	X	X										
Cocconeis placentula										X	X				
Cymbella sp.			X	X											
Cymbella affinis															
Cymbella ventricosa										X					
Cymbella tumida									X	X					
Cyclotella sp.															
Cyclotella meneghiniana															
Cymatopleura sp.				X											
Cymatopleura solea									X		X				
Deploneis sp.															
Diatoma sp.		X			X										
Diatoma vulgare									X	X	X				
Diatoma tenua var. *elongatum*															
Eunotia sp.			X												
Eunotia pectinalis															
Fragilaria sp.		X													
Fragilaria crotonensis															
Fragilaria construens									X						

Table B-5-5 (Continued)
Station

P-1 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
Frustulia sp.		X	X	X	X										
Gomphoneis sp.															
Gomphonema sp.		X	X	X	X										
Gomphonema olivaceum										X					
Gomphonema constrictum										X					
Gyrosigma sp.			X												
Gyrosigma acuminatum									X						
Hannaea arcus															
Melosira sp.															
Meridion sp.			X	X											
Meridion circulare									X						
Navicula sp.		X	X	X	X										
Navicula cryptocephala									X	X	X				
Navicula rhynochocephala										X	X				
Navicula viridula									X	X	X				
Nedium sp.					X										
Nitzschia sp.			X	X	X										
Nitzschia gracilis															
Nitzschia sigmoidea									X						
Nitzschia acicularis									X						
Nitzschia palea									X						
Nitzschia paleacea											X				
Pinnularia sp.				X											
Pinnularia viridis									X						
Rhoicosphenia sp.		X													
Rhoicosphenia curvata										X					
Rhopalodia sp.															
Stauroneis sp.			X	X	X										
Stephanodiscus hantzschii									X						
Surirella sp.			X	X	X										
Surirella ovata									X	X					
Synedra sp.			X	X	X										
Synedra ulna									X		X				
Synedra ulna var. *Impressa*															
Synedra rupens															
Tabellaria sp.				X	X										
CYANOPHYTA															
Agmenellum sp.															
Anabaena sp.									X						
Lyngbya sp.															
Lyngbya spirulinoidea															
Nodularia sp.															
Oscillatoria sp.															
Oscillatoria limnetica															
Oscillatoria limosa															
Phormidium sp.															
EUGLENOPHYCEAE															
Euglena acus											X				
TRACHEOPHYTA															
Naja sp.															
Ranuculus sp.															
Potamogeton sp.															
Mimulus sp.															
Rorippa sp.															
TOTAL NUMBER SPECIES/MONTH		8	14	16	14				20	14	10				

Table B-5-5 (Continued)
Station

P-2 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
CHLOROPHYCEAE															
Actinastrum sp.															
Cladophora sp.		X				X									
Chaetophora sp.															
Closterium sp.															
Closterium liebleinii															
Closterium lunula															
Closterium gracilis															
Cosmarium sp.															
Enteromorpha sp.			X												
Microspora sp.						X									
Pediastrum sp.															
Protococcus sp.															
Protococcus viridis															
Protoderma viride															
Scenedesmus sp.		X													
Spirogyra sp.															
Stigoclonium sp.															
Ulothrix sp.															
Ulothrix zonata									X						
Vaucheria sp.															
Zygnema sp.															
Draparnaldia sp.															
Unidentified Zygnemataceaen															
Unidentified Green Coccoid															
BACILLARIOPHYCEAE															
Achnanthes sp.															
Achnanthes lanceolata															
Achnanthes lanceolata var. *Dubia*															
Amphora sp.		X		X	X										
Amphora ovalis									X		X				
Amphiphora ornata															
Asterionella sp.															
Caloneis sp.		X		X											
Caloneis amphisbaena									X						
Caloneis silicula															
Ceratoneis sp.															
Cocconeis sp.		X	X	X		X									
Cocconeis placentula										X	X				
Cymbella sp.			X	X		X									
Cymbella affinis															
Cymbella ventricosa										X	X				
Cymbella tumida															
Cyclotella sp.															
Cyclotella meneghiniana															
Cymatopleura sp.			X	X											
Cymatopleura solea															
Deploneis sp.															
Diatoma sp.		X	X		X	X									
Diatoma vulgare									X						
Diatoma tenua var. *Elongatum*															
Eunotia sp.			X												
Eunotia pectinalis									X						
Fragilaria sp.		X			X	X									
Fragilaria crotonensis															
Fragilaria construens									X						

Table B-5-5 (Continued)
Station

P-2 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
Frustulia sp.	X	X	X	X	X										
Gomphoneis sp.					X										
Gomphonema sp.		X	X		X										
Gomphonema olivaceum											X				
Gomphonema constrictum									X	X					
Gyrosigma sp.		X	X		X	X									
Gyrosigma acuminatum									X						
Hannaea arcus															
Melosira sp.															
Meridion sp.		X	X	X	X										
Meridion circulare									X						
Navicula sp.		X	X	X	X	X									
Navicula cryptocephala									X	X	X				
Navicula rhynochocephala										X					
Navicula viridula									X		X				
Nedium sp.															
Nitzschia sp.		X	X	X	X	X									
Nitzschia gracilis															
Nitzschia sigmoidea															
Nitzschia acicularis									X						
Nitzschia palea									X	X					
Nitzschia paleacea															
Pinnularia sp.						X									
Pinnularia viridis									X	X					
Rhoicosphenia sp.		X													
Rhoicosphenia curvata															
Rhopalodia sp.				X											
Stauroneis sp.				X	X										
Stephanodiscus hantzschii										X	X				
Surirella sp.		X	X		X	X									
Surirella ovata									X						
Synedra sp.		X	X	X	X	X									
Synedra ulna									X						
Synedra ulna var. Impressa															
Synedra rupens															
Tabellaria sp.		X	X	X	X	X									
CYANOPHYTA															
Agmenellum sp.															
Anabaena sp.									X						
Lyngbya sp.						X									
Lyngbya spirulinoidea										X					
Nodularia sp.															
Oscillatoria sp.															
Oscillatoria limnetica															
Oscillatoria limosa															
Phormidium sp.															
EUGLENOPHYCEAE															
Euglena acus															
TRACHEOPHYTA															
Naja sp.															
Ranuculus sp.															
Potamogeton sp.															
Mimulus sp.															
Rorippa sp.															
TOTAL NUMBER SPECIES/MONTH		17	15	13	16			17	9	7					

Table B-5-5 (Continued)
Station

P-3 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
CHLOROPHYCEAE															
Actinastrum sp.															
Cladophora sp.															
Chaetophora sp.															
Closterium sp.				X											
Closterium liebleinii															
Closterium lunula															
Closterium gracilis															
Cosmarium sp.															
Enteromorpha sp.															
Microspora sp.															
Pediastrum sp.															
Protococcus sp.															
Protococcus viridis															
Protoderma viride													X		
Scenedesmus sp.			X												
Spirogyra sp.															
Stigoclonium sp.				X											
Ulothrix sp.													X		
Ulothrix zonata															
Vaucheria sp.				X											
Zygnema sp.															
Draparnaldia sp.															
Unidentified Zygnemataceaen															
Unidentified Green Coccoid															
BACILLARIOPHYCEAE															
Achnanthes sp.												X	X		X
Achnanthes lanceolata															
Achnanthes lanceolata var. *Dubia*															
Amphora sp.		X	X	X											
Amphora ovalis									X		X		X	X	X
Amphiphora ornata															
Asterionella sp.															
Caloneis sp.		X	X												
Caloneis amphisbaena									X						
Caloneis silicula									X						
Ceratoneis sp.															
Cocconeis sp.			X	X											
Cocconeis placentula									X	X	X	X		X	X
Cymbella sp.		X	X												
Cymbella affinis									X						
Cymbella ventricosa										X	X				
Cymbella tumida															X
Cyclotella sp.															
Cyclotella meneghiniana															
Cymatopleura sp.				X											
Cymatopleura solea									X				X		
Deploneis sp.															
Diatoma sp.				X											
Diatoma vulgare									X				X		X
Diatoma tenua var. *Elongatum*															
Eunotia sp.															
Eunotia pectinalis													X		
Fragilaria sp.				X											
Fragilaria crotonensis									X						X
Fragilaria construens		X													

Table B-5-5 (Continued)
Station

P-3 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
Frustulia sp.		X	X	X											
Gomphoneis sp.		X													
Gomphonema sp.		X	X	X											
Gomphonema olivaceum										X		X			
Gomphonema constrictum									X				X	X	
Gyrosigma sp.		X	X	X											
Gyrosigma acuminatum															
Hannaea arcus															
Melosira sp.															
Meridion sp.															
Meridion circulare									X						
Navicula sp.		X	X	X											
Navicula cryptocephala									X	X	X		X	X	X
Navicula rhynochocephala										X		X	X	X	X
Navicula viridula									X	X	X	X	X		
Nedium sp.															
Nitzschia sp.		X		X											
Nitzschia gracilis													X		
Nitzschia sigmoidea															
Nitzschia acicularis															
Nitzschia palea									X					X	
Nitzschia paleacea															
Pinnularia sp.															
Pinnularia viridis									X					X	
Rhoicosphenia sp.		X													
Rhoicosphenia curvata			X												
Rhopalodia sp.															
Stauroneis sp.				X											
Stephanodiscus hantzschii									X			X			
Surirella sp.		X	X	X											
Surirella ovata									X						
Synedra sp.		X	X	X											
Synedra ulna									X			X			X
Synedra ulna var. *Impressa*															
Synedra rupens															
Tabellaria sp.		X	X	X											
CYANOPHYTA															
Agmenellum sp.															
Anabaena sp.															
Lyngbya sp.															
Lyngbya spirulinoidea															
Nodularia sp.															
Oscillatoria sp.															
Oscillatoria limnetica															
Oscillatoria limosa															
Phormidium sp.			X												
EUGLENOPHYCEAE															
Euglena acus															
TRACHEOPHYTA															
Naja sp.															
Ranuculus sp.															
Potamogeton sp.															
Mimulus sp.															
Rorippa sp.															
TOTAL NUMBER SPECIES/MONTH		13	15	17					17	6	5	7	12	7	9

Table B-5-5 (Continued)
Station

P-4 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
CHLOROPHYCEAE															
Actinastrum sp.			X	X											
Cladophora sp.		X													
Chaetophora sp.															
Closterium sp.															
Closterium liebleinii															
Closterium lunula															
Closterium gracilis															
Cosmarium sp.															
Enteromorpha sp.			X												
Microspora sp.															
Pediastrum sp.		X													
Protococcus sp.															
Protococcus viridis															
Protoderma viride															
Scenedesmus sp.															
Spirogyra sp.															
Stigoclonium sp.															
Ulothrix sp.															
Ulothrix zonata															
Vaucheria sp.															
Zygnema sp.															
Draparnaldia sp.															
Unidentified Zygnemataceaen															
Unidentified Green Coccoid															
BACILLARIOPHYCEAE															
Achnanthes sp.				X											
Achnanthes lanceolata															
Achnanthes lanceolata var. *Dubia*															
Amphora sp.			X												
Amphora ovalis															
Amphiphora ornata															
Asterionella sp.															
Caloneis sp.			X	X											
Caloneis amphisbaena															
Caloneis silicula															
Ceratoneis sp.															
Cocconeis sp.		X		X											
Cocconeis placentula															
Cymbella sp.															
Cymbella affinis															
Cymbella ventricosa															
Cymbella tumida															
Cyclotella sp.															
Cyclotella meneghiniana															
Cymatopleura sp.															
Cymatopleura solea															
Deploneis sp.															
Diatoma sp.		X	X	X											
Diatoma vulgare															
Diatoma tenua var. *Elongatum*															
Eunotia sp.															
Eunotia pectinalis															
Fragilaria sp.			X												
Fragilaria crotonensis															
Fragilaria construens															

Table B-5-5 (Continued)
Station

P-4 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
Frustulia sp.			X	X											
Gomphoneis sp.															
Gomphonema sp.				X											
Gomphonema olivaceum															
Gomphonema constrictum															
Gyrosigma sp.			X												
Gyrosigma acuminatum															
Hannaea arcus															
Melosira sp.															
Meridion sp.		X													
Meridion circulare															
Navicula sp.			X	X											
Navicula cryptocephala															
Navicula rhynochocephala															
Navicula viridula															
Nedium sp.															
Nitzschia sp.			X	X											
Nitzschia gracilis															
Nitzschia sigmoidea															
Nitzschia acicularis															
Nitzschia palea															
Nitzschia paleacea															
Pinnularia sp.															
Pinnularia viridis															
Rhoicosphenia sp.			X												
Rhoicosphenia curvata															
Rhopalodia sp.															
Stauroneis sp.				X											
Stephanodiscus hantzschii															
Surirella sp.			X												
Surirella ovata															
Synedra sp.				X											
Synedra ulna															
Synedra ulna var. *Impressa*															
Synedra rupens															
Tabellaria sp.			X	X											
CYANOPHYTA															
Agmenellum sp.															
Anabaena sp.															
Lyngbya sp.															
Lyngbya spirulinoidea															
Nodularia sp.															
Oscillatoria sp.															
Oscillatoria limnetica															
Oscillatoria limosa															
Phormidium sp.															
EUGLENOPHYCEAE															
Euglena acus															
TRACHEOPHYTA															
Naja sp.															
Ranuculus sp.															
Potamogeton sp.															
Mimulus sp.															
Rorippa sp.															
TOTAL NUMBER SPECIES/MONTH		5	13	12											

Table B-5-5 (Continued)
Station

P-5 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
CHLOROPHYCEAE															
Actinastrum sp.															
Cladophora sp.															
Chaetophora sp.															
Closterium sp.															
Closterium liebleinii															
Closterium lunula															
Closterium gracilis															
Cosmarium sp.															
Enteromorpha sp.															
Microspora sp.															
Pediastrum sp.															
Protococcus sp.															
Protococcus viridis															
Protoderma viride															
Scenedesmus sp.															
Spirogyra sp.															
Stigoclonium sp.															
Ulothrix sp.															
Ulothrix zonata															
Vaucheria sp.															
Zygnema sp.															
Draparnaldia sp.															
Unidentified Zygnemataceaen															
Unidentified Green Coccoid															
BACILLARIOPHYCEAE															
Achnanthes sp.															
Achnanthes lanceolata															
Achnanthes lanceolata var. *Dubia*															
Amphora sp.															
Amphora ovalis									X	X					
Amphiphora ornata															
Asterionella sp.															
Caloneis sp.															
Caloneis amphisbaena									X						
Caloneis silicula															
Ceratoneis sp.															
Cocconeis sp.															
Cocconeis placentula									X	X	X				
Cymbella sp.															
Cymbella affinis															
Cymbella ventricosa										X					
Cymbella tumida										X					
Cyclotella sp.															
Cyclotella meneghiniana															
Cymatopleura sp.															
Cymatopleura solea									X						
Deploneis sp.															
Diatoma sp.															
Diatoma vulgare									X						
Diatoma tenua var. *Elongatum*															
Eunotia sp.															
Eunotia pectinalis															
Fragilaria sp.															
Fragilaria crotonensis															
Fragilaria construens															

Table B-5-5 (Continued)
Station

P-5 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
Frustulia sp.															
Gomphoneis sp.															
Gomphonema sp.															
Gomphonema olivaceum									X	X					
Gomphonema constrictum									X						
Gyrosigma sp.															
Gyrosigma acuminatum									X						
Hannaea arcus															
Melosira sp.															
Meridion sp.															
Meridion circulare															
Navicula sp.															
Navicula cryptocephala									X	X	X				
Navicula rhynochocephala										X					
Navicula viridula									X	X					
Nedium sp.															
Nitzschia sp.															
Nitzschia gracilis															
Nitzschia sigmoidea															
Nitzschia acicularis									X	X					
Nitzschia palea															
Nitzschia paleacea															
Pinnularia sp.															
Pinnularia viridis															
Rhoicosphenia sp.															
Rhoicosphenia curvata									X						
Rhopalodia sp.															
Stauroneis sp.															
Stephanodiscus hantzschii									X						
Surirella sp.															
Surirella ovata									X						
Synedra sp.															
Synedra ulna															
Synedra ulna var. *Impressa*															
Synedra rupens															
Tabellaria sp.															
CYANOPHYTA															
Agmenellum sp.															
Anabaena sp.															
Lyngbya sp.															
Lyngbya spirulinoidea															
Nodularia sp.															
Oscillatoria sp.															
Oscillatoria limnetica															
Oscillatoria limosa															
Phormidium sp.															
EUGLENOPHYCEAE															
Euglena acus									X						
TRACHEOPHYTA															
Naja sp.															
Ranuculus sp.															
Potamogeton sp.															
Mimulus sp.															
Rorippa sp.															
TOTAL NUMBER SPECIES/MONTH									15	9	2				

Table B-5-5 (Continued)
Station

P-5A TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
CHLOROPHYCEAE															
Actinastrum sp.						X									
Cladophora sp.															
Chaetophora sp.															
Closterium sp.															
Closterium liebleinii															
Closterium lunula															
Closterium gracilis															
Cosmarium sp.															
Enteromorpha sp.															
Microspora sp.															
Pediastrum sp.															
Protococcus sp.															
Protococcus viridis															
Protoderma viride															
Scenedesmus sp.															
Spirogyra sp.															
Stigoclonium sp.															
Ulothrix sp.										X					X
Ulothrix zonata															X
Vaucheria sp.															
Zygnema sp.															
Draparnaldia sp.										X					
Unidentified Zygnemataceaen										X					
Unidentified Green Coccoid															
BACILLARIOPHYCEAE															
Achnanthes sp.															
Achnanthes lanceolata											X				
Achnanthes lanceolata var. *Dubia*															
Amphora sp.															
Amphora ovalis											X				X
Amphiphora ornata															
Asterionella sp.															
Caloneis sp.															
Caloneis amphisbaena															X
Caloneis silicula															
Ceratoneis sp.															
Cocconeis sp.					X										
Cocconeis placentula											X				X
Cymbella sp.					X	X									
Cymbella affinis															
Cymbella ventricosa										X	X				
Cymbella tumida										X	X				
Cyclotella sp.															
Cyclotella meneghiniana															
Cymatopleura sp.															
Cymatopleura solea															
Deploneis sp.															
Diatoma sp.															
Diatoma vulgare															
Diatoma tenua var. *Elongatum*															
Eunotia sp.															
Eunotia pectinalis															
Fragilaria sp.					X										
Fragilaria crotonensis															X
Fragilaria construens															

Table B-5-5 (Continued)
Station

P-5A TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
Frustulia sp.						X									
Gomphoneis sp.															
Gomphonema sp.															
Gomphonema olivaceum										X					X
Gomphonema constrictum															
Gyrosigma sp.					X										
Gyrosigma acuminatum															
Hannaea arcus															
Melosira sp.															
Meridion sp.					X										
Meridion circulare															
Navicula sp.					X	X									
Navicula cryptocephala										X	X				X
Navicula rhynochocephala										X					X
Navicula viridula										X	X				
Nedium sp.															
Nitzschia sp.															
Nitzschia gracilis										X					
Nitzschia sigmoidea															
Nitzschia acicularis															
Nitzschia palea										X					
Nitzschia paleacea										X					
Pinnularia sp.															
Pinnularia viridis										X					X
Rhoicosphenia sp.						X									
Rhoicosphenia curvata															X
Rhopalodia sp.															
Stauroneis sp.						X									
Stephanodiscus hantzschii										X					
Surirella sp.					X										
Surirella ovata										X					
Synedra sp.					X										
Synedra ulna															X
Synedra ulna var. *Impressa*															
Synedra rupens															
Tabellaria sp.															
CYANOPHYTA															
Agmenellum sp.															
Anabaena sp.															
Lyngbya sp.															
Lyngbya spirulinoidea															
Nodularia sp.															
Oscillatoria sp.															
Oscillatoria limnetica										X					
Oscillatoria limosa															
Phormidium sp.															
EUGLENOPHYCEAE															
Euglena acus															
TRACHEOPHYTA															
Naja sp.															
Ranuculus sp.															
Potamogeton sp.															
Mimulus sp.															
Rorippa sp.															
TOTAL NUMBER SPECIES/MONTH					8	6				14	7				12

Table B-5-5 (Continued)
Station

P-6 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
CHLOROPHYCEAE															
Actinastrum sp.			X	X											
Cladophora sp.		X		X											
Chaetophora sp.															
Closterium sp.															
Closterium liebleinii															
Closterium lunula															
Closterium gracilis									X						
Cosmarium sp.															
Enteromorpha sp.															
Microspora sp.															
Pediastrum sp.															
Protococcus sp.															
Protococcus viridis															
Protoderma viride									X						
Scenedesmus sp.															
Spirogyra sp.															
Stigoclonium sp.															
Ulothrix sp.									X			X			
Ulothrix zonata															
Vaucheria sp.															
Zygnema sp.															
Draparnaldia sp.															
Unidentified Zygnemataceaen															
Unidentified Green Coccoid								X							
BACILLARIOPHYCEAE															
Achnanthes sp.				X											
Achnanthes lanceolata								X				X	X		
Achnanthes lanceolata var. *Dubia*															
Amphora sp.															
Amphora ovalis									X				X		X
Amphiphora ornata															
Asterionella sp.															
Caloneis sp.		X	X	X											
Caloneis amphisbaena									X					X	
Caloneis silicula															
Ceratoneis sp.															
Cocconeis sp.		X	X	X											
Cocconeis placentula								X	X		X	X	X		X
Cymbella sp.		X	X												
Cymbella affinis															
Cymbella ventricosa										X	X				
Cymbella tumida													X		
Cyclotella sp.															
Cyclotella meneghiniana															
Cymatopleura sp.			X												
Cymatopleura solea															X
Deploneis sp.		X													
Diatoma sp.		X													
Diatoma vulgare								X							
Diatoma tenua var. *Elongatum*									X						
Eunotia sp.															
Eunotia pectinalis															
Fragilaria sp.															
Fragilaria crotonensis												X	X		
Fragilaria construens									X						

Table B-5-5 (Continued)
Station

P-6 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
Frustulia sp.		X	X	X											
Gomphoneis sp.															
Gomphonema sp.		X		X											
Gomphonema olivaceum									X			X			
Gomphonema constrictum											X				X
Gyrosigma sp.		X	X	X											
Gyrosigma acuminatum															
Hannaea arcus															
Melosira sp.															
Meridion sp.		X													
Meridion circulare															
Navicula sp.		X	X	X											
Navicula cryptocephala								X	X	X	X	X		X	X
Navicula rhynochocephala												X	X		X
Navicula viridula								X	X	X		X	X	X	
Nedium sp.				X											
Nitzschia sp.		X	X	X											
Nitzschia gracilis								X							
Nitzschia sigmoidea															
Nitzschia acicularis									X						X
Nitzschia palea									X		X				X
Nitzschia paleacea															
Pinnularia sp.			X	X											
Pinnularia viridis															X
Rhoicosphenia sp.															
Rhoicosphenia curvata															
Rhopalodia sp.			X												
Stauroneis sp.															
Stephanodiscus hantzschii										X	X	X			
Surirella sp.		X		X											
Surirella ovata			X					X	X						
Synedra sp.		X		X											
Synedra ulna									X						X
Synedra ulna var. *Impressa*															
Synedra rupens								X	X						
Tabellaria sp.			X	X											
CYANOPHYTA															
Agmenellum sp.															
Anabaena sp.			X					X	X						
Lyngbya sp.															
Lyngbya spirulinoidea										X					
Nodularia sp.															
Oscillatoria sp.															
Oscillatoria limnetica															
Oscillatoria limosa															
Phormidium sp.															
EUGLENOPHYCEAE															
Euglena acus															
TRACHEOPHYTA															
Naja sp.															
Ranuculus sp.															
Potamogeton sp.															
Mimulus sp.															
Rorippa sp.															
TOTAL NUMBER SPECIES/MONTH		14	14	15				10	17	5	6	9	7	3	10

Table B-5-5 (Continued)
Station

P-7 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
CHLOROPHYCEAE															
Actinastrum sp.			X												
Cladophora sp.															
Chaetophora sp.															
Closterium sp.															
Closterium liebleinii									X						
Closterium lunula															
Closterium gracilis															
Cosmarium sp.															
Enteromorpha sp.															
Microspora sp.															
Pediastrum sp.															
Protococcus sp.															
Protococcus viridis															
Protoderma viride															
Scenedesmus sp.															
Spirogyra sp.															
Stigoclonium sp.															
Ulothrix sp.															
Ulothrix zonata															
Vaucheria sp.															
Zygnema sp.															
Draparnaldia sp.															
Unidentified Zygnemataceaen															
Unidentified Green Coccoid															
BACILLARIOPHYCEAE															
Achnanthes sp.															
Achnanthes lanceolata											X				X
Achnanthes lanceolata var. *Dubia*															
Amphora sp.			X	X											
Amphora ovalis								X						X	X
Amphiphora ornata															
Asterionella sp.															
Caloneis sp.			X												
Caloneis amphisbaena															
Caloneis silicula															
Ceratoneis sp.															
Cocconeis sp.			X	X											
Cocconeis placentula										X	X				X
Cymbella sp.															
Cymbella affinis															
Cymbella ventricosa											X				
Cymbella tumida										X					
Cyclotella sp.															
Cyclotella meneghiniana															
Cymatopleura sp.															
Cymatopleura solea															
Deploneis sp.															
Diatoma sp.															
Diatoma vulgare									X						
Diatoma tenua var. *Elongatum*															
Eunotia sp.															
Eunotia pectinalis															
Fragilaria sp.															
Fragilaria crotonensis															
Fragilaria construens															

Table B-5-5 (Continued)
Station

P-7 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
Frustulia sp.			X	X											
Gomphoneis sp.															
Gomphonema sp.			X												
Gomphonema olivaceum								X							
Gomphonema constrictum										X	X				
Gyrosigma sp.			X												
Gyrosigma acuminatum														X	X
Hannaea arcus															
Melosira sp.															
Meridion sp.															
Meridion circulare															
Navicula sp.			X	X											
Navicula cryptocephala								X		X	X			X	X
Navicula rhynchocephala								X			X			X	X
Navicula viridula									X	X	X			X	
Nedium sp.															
Nitzschia sp.			X	X											
Nitzschia gracilis									X					X	
Nitzschia sigmoidea															
Nitzschia acicularis														X	
Nitzschia palea									X	X					X
Nitzschia paleacea										X					
Pinnularia sp.															
Pinnularia viridis								X	X					X	
Rhoicosphenia sp.															
Rhoicosphenia curvata															
Rhopalodia sp.															
Stauroneis sp.															
Stephanodiscus hantzschii											X				
Surirella sp.			X												
Surirella ovata															X
Synedra sp.			X												
Synedra ulna								X	X					X	
Synedra ulna var. *Impressa*															
Synedra rupens										X					
Tabellaria sp.			X												
CYANOPHYTA															
Agmenellum sp.															
Anabaena sp.															
Lyngbya sp.															
Lyngbya spirulinoidea															
Nodularia sp.															
Oscillatoria sp.															
Oscillatoria limnetica															
Oscillatoria limosa															
Phormidium sp.															
EUGLENOPHYCEAE															
Euglena acus															
TRACHEOPHYTA															
Naja sp.															
Ranunculus sp.															
Potamogeton sp.															
Mimulus sp.															
Rorippa sp.															
TOTAL NUMBER SPECIES/MONTH			12	5				6	7	8	8			9	8

Table B-5-5 (Continued)
Station

S-1 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
CHLOROPHYCEAE															
Actinastrum sp.			X	X											
Cladophora sp.															
Chaetophora sp.			X												
Closterium sp.															
Closterium liebleinii															
Closterium lunula															
Closterium gracilis															
Cosmarium sp.															
Enteromorpha sp.															
Microspora sp.						X		X							
Pediastrum sp.															
Protococcus sp.															
Protococcus viridis															
Protoderma viride								X	X		X	X			
Scenedesmus sp.															
Spirogyra sp.															
Stigoclonium sp.															
Ulothrix sp.									X						
Ulothrix zonata								X				X			
Vaucheria sp.															
Zygnema sp.															
Draparnaldia sp.															
Unidentified Zygnemataceaen															
Unidentified Green Coccoid															
BACILLARIOPHYCEAE															
Achnanthes sp.															
Achnanthes lanceolata								X			X	X	X	X	
Achnanthes lanceolata var. *Dubia*															
Amphora sp.				X	X										
Amphora ovalis								X	X				X		
Amphiphora ornata															
Asterionella sp.						X									
Caloneis sp.															
Caloneis amphisbaena								X						X	
Caloneis silicula															
Ceratoneis sp.															
Cocconeis sp.		X	X	X	X	X									
Cocconeis placentula								X	X		X	X	X	X	
Cymbella sp.		X	X			X									
Cymbella affinis															
Cymbella ventricosa								X							
Cymbella tumida									X					X	
Cyclotella sp.															
Cyclotella meneghiniana															
Cymatopleura sp.															
Cymatopleura solea															
Deploneis sp.															
Diatoma sp.					X										
Diatoma vulgare								X		X	X		X		
Diatoma tenua var. *Elongatum*															
Eunotia sp.															
Eunotia pectinalis															
Fragilaria sp.			X		X	X									
Fragilaria crotonensis										X	X	X	X		
Fragilaria construens								X							

Table B-5-5 (Continued)
Station

S-1 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
Frustulia sp.		X	X			X									
Gomphoneis sp.															
Gomphonema sp.		X	X	X	X	X									
Gomphonema olivaceum								X		X	X				
Gomphonema constrictum								X						X	
Gyrosigma sp.			X	X		X									
Gyrosigma acuminatum								X	X				X	X	
Hannaea arcus										X					
Melosira sp.															
Meridion sp.			X	X	X										
Meridion circulare								X	X	X	X				
Navicula sp.		X	X	X	X	X									
Navicula cryptocephala								X	X	X	X	X	X	X	
Navicula rhynochocephala								X	X	X	X	X			
Navicula viridula								X	X	X	X	X	X	X	
Nedium sp.															
Nitzschia sp.		X	X	X	X	X									
Nitzschia gracilis									X	X					
Nitzschia sigmoidea								X							
Nitzschia acicularis								X							
Nitzschia palea								X	X	X	X	X			
Nitzschia paleacea									X						
Pinnularia sp.						X									
Pinnularia viridis								X		X	X		X	X	
Rhoicosphenia sp.					X	X									
Rhoicosphenia curvata															
Rhopalodia sp.				X											
Stauroneis sp.				X	X	X									
Stephanodiscus hantzschii									X						
Surirella sp.			X	X		X									
Surirella ovata								X	X	X			X	X	
Synedra sp.		X			X	X									
Synedra ulna								X	X	X		X	X	X	
Synedra ulna var. *Impressa*								X							
Synedra rupens															
Tabellaria sp.		X	X	X	X	X									
CYANOPHYTA															
Agmenellum sp.															
Anabaena sp.															
Lyngbya sp.															
Lyngbya spirulinoidea															
Nodularia sp.					X										
Oscillatoria sp.															
Oscillatoria limnetica								X							
Oscillatoria limosa										X					
Phormidium sp.															
EUGLENOPHYCEAE															
Euglena acus															
TRACHEOPHYTA															
Naja sp.															
Ranuculus sp.															
Potamogeton sp.															
Mimulus sp.															
Rorippa sp.															
TOTAL NUMBER SPECIES/MONTH		8	13	12	13	16		23	16	14	12	10	11	11	

Table B-5-5 (Continued)
Station

S-2 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
CHLOROPHYCEAE															
Actinastrum sp.		X	X	X											
Cladophora sp.															
Chaetophora sp.															
Closterium sp.															
Closterium liebleinii															
Closterium lunula															
Closterium gracilis															
Cosmarium sp.															
Enteromorpha sp.															
Microspora sp.		X						X							
Pediastrum sp.		X													
Protococcus sp.		X													
Protococcus viridis															
Protoderma viride									X	X	X				
Scenedesmus sp.															
Spirogyra sp.															
Stigoclonium sp.															
Ulothrix sp.										X	X				
Ulothrix zonata											X				
Vaucheria sp.															
Zygnema sp.										X					
Draparnaldia sp.															
Unidentified Zygnemataceaen										X					
Unidentified Green Coccoid															
BACILLARIOPHYCEAE															
Achnanthes sp.						X									
Achnanthes lanceolata															X
Achnanthes lanceolata var. *Dubia*															
Amphora sp.		X	X		X										
Amphora ovalis									X	X	X			X	X
Amphiphora ornata								X							
Asterionella sp.															
Caloneis sp.			X												
Caloneis amphisbaena															
Caloneis silicula															
Ceratoneis sp.															
Cocconeis sp.		X	X	X		X									
Cocconeis placentula								X	X	X	X				X
Cymbella sp.						X									
Cymbella affinis															
Cymbella ventricosa															
Cymbella tumida															
Cyclotella sp.		X													
Cyclotella meneghiniana															
Cymatopleura sp.															
Cymatopleura solea															
Deploneis sp.															
Diatoma sp.		X			X										
Diatoma vulgare								X	X					X	
Diatoma tenua var. *Elongatum*															
Eunotia sp.															
Eunotia pectinalis															
Fragilaria sp.		X	X		X										
Fragilaria crotonensis											X				
Fragilaria construens								X	X					X	

Table B-5-5 (Continued)
Station

S-2 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
Frustulia sp.		X	X		X										
Gomphoneis sp.						X									
Gomphonema sp.		X	X	X	X										
Gomphonema olivaceum									X	X	X				
Gomphonema constrictum											X			X	
Gyrosigma sp.		X	X			X									
Gyrosigma acuminatum															
Hannaea arcus										X					
Melosira sp.															
Meridion sp.		X			X	X									
Meridion circulare											X				
Navicula sp.		X	X	X	X	X									
Navicula cryptocephala								X	X	X	X			X	X
Navicula rhynochocephala									X	X	X			X	
Navicula viridula								X	X	X	X			X	
Nedium sp.															
Nitzschia sp.		X	X		X	X									
Nitzschia gracilis								X		X					
Nitzschia sigmoidea															
Nitzschia acicularis															
Nitzschia palea										X					
Nitzschia paleacea															
Pinnularia sp.			X	X											
Pinnularia viridis								X		X	X				
Rhoicosphenia sp.		X			X										
Rhoicosphenia curvata															
Rhopalodia sp.															
Stauroneis sp.				X	X	X									
Stephanodiscus hantzschii															
Surirella sp.		X	X	X	X										
Surirella ovata								X	X	X					
Synedra sp.		X	X	X											
Synedra ulna									X	X	X			X	
Synedra ulna var. *Impressa*															
Synedra rupens															
Tabellaria sp.		X				X									
CYANOPHYTA															
Agmenellum sp.															
Anabaena sp.								X							
Lyngbya sp.															
Lyngbya spirulinoidea															
Nodularia sp.															
Oscillatoria sp.															
Oscillatoria limnetica															
Oscillatoria limosa										X					
Phormidium sp.		X													
EUGLENOPHYCEAE															
Euglena acus															
TRACHEOPHYTA															
Naja sp.															
Ranuculus sp.															
Potamogeton sp.															
Mimulus sp.															
Rorippa sp.															
TOTAL NUMBER SPECIES/MONTH		20	13	8	11	10		11	11	17	14			8	4

Table B-5-5 (Continued)
Station

U.S.L. TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
CHLOROPHYCEAE															
Actinastrum sp.															
Cladophora sp.															
Chaetophora sp.															
Closterium sp.															
Closterium liebleinii															
Closterium lunula															
Closterium gracilis															
Cosmarium sp.															
Enteromorpha sp.															
Microspora sp.															
Pediastrum sp.															
Protococcus sp.															
Protococcus viridis															
Protoderma viride										X					
Scenedesmus sp.															
Spirogyra sp.										X					
Stigoclonium sp.															
Ulothrix sp.											X				
Ulothrix zonata									X		X				
Vaucheria sp.															
Zygnema sp.															
Draparnaldia sp.															
Unidentified Zygnemataceaen									X						
Unidentified Green Coccoid															
BACILLARIOPHYCEAE															
Achnanthes sp.															
Achnanthes lanceolata										X	X				
Achnanthes lanceolata var. *Dubia*															
Amphora sp.															
Amphora ovalis										X	X				
Amphiphora ornata															
Asterionella sp.															
Caloneis sp.															
Caloneis amphisbaena															
Caloneis silicula															
Ceratoneis sp.															
Cocconeis sp.															
Cocconeis placentula											X				
Cymbella sp.															
Cymbella affinis									X		X				
Cymbella ventricosa									X						
Cymbella tumida											X				
Cyclotella sp.															
Cyclotella meneghiniana															
Cymatopleura sp.															
Cymatopleura solea															
Deploneis sp.															
Diatoma sp.															
Diatoma vulgare									X	X					
Diatoma tenua var. *Elongatum*															
Eunotia sp.															
Eunotia pectinalis															
Fragilaria sp.															
Fragilaria crotonensis										X	X				
Fragilaria construens															

Table B-5-5 (Continued)
Station

U.S.L. TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
Frustulia sp.															
Gomphoneis sp.															
Gomphonema sp.															
Gomphonema olivaceum										X					
Gomphonema constrictum									X	X	X				
Gyrosigma sp.															
Gyrosigma acuminatum															
Hannaea arcus										X					
Melosira sp.															
Meridion sp.															
Meridion circulare															
Navicula sp.															
Navicula cryptocephala										X	X				
Navicula rhynochocephala										X	X				
Navicula viridula									X						
Nedium sp.															
Nitzschia sp.															
Nitzschia gracilis									X		X				
Nitzschia sigmoidea															
Nitzschia acicularis									X	X	X				
Nitzschia palea									X	X	X				
Nitzschia paleacea															
Pinnularia sp.															
Pinnularia viridis										X					
Rhoicosphenia sp.															
Rhoicosphenia curvata															
Rhopalodia sp.															
Stauroneis sp.															
Stephanodiscus hantzschii									X	X	X				
Surirella sp.															
Surirella ovata															
Synedra sp.															
Synedra ulna									X		X				
Synedra ulna var. *Impressa*															
Synedra rupens															
Tabellaria sp.											X				
CYANOPHYTA															
Agmenellum sp.															
Anabaena sp.															
Lyngbya sp.															
Lyngbya spirulinoidea															
Nodularia sp.															
Oscillatoria sp.															
Oscillatoria limnetica															
Oscillatoria limosa															
Phormidium sp.															
EUGLENOPHYCEAE															
Euglena acus															
TRACHEOPHYTA															
Naja sp.															
Ranuculus sp.															
Potamogeton sp.															
Mimulus sp.															
Rorippa sp.															
TOTAL NUMBER SPECIES/MONTH									12	15	17				

Table B-5-5 (Continued)
Station

L.S.L. TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
CHLOROPHYCEAE															
Actinastrum sp.															
Cladophora sp.															
Chaetophora sp.															
Closterium sp.															
Closterium liebleinii															
Closterium lunula															
Closterium gracilis															
Cosmarium sp.															
Enteromorpha sp.															
Microspora sp.															
Pediastrum sp.															
Protococcus sp.															
Protococcus viridis															
Protoderma viride										X			X		
Scenedesmus sp.															
Spirogyra sp.										X					
Stigoclonium sp.															
Ulothrix sp.									X		X				
Ulothrix zonata									X	X					
Vaucheria sp.															
Zygnema sp.															
Draparnaldia sp.															
Unidentified Zygnemataceaen															
Unidentified Green Coccoid															
BACILLARIOPHYCEAE															
Achnanthes sp.															
Achnanthes lanceolata												X	X		
Achnanthes lanceolata var. *Dubia*															
Amphora sp.															
Amphora ovalis									X	X	X	X	X		
Amphiphora ornata															
Asterionella sp.															
Caloneis sp.															
Caloneis amphisbaena									X				X		
Caloneis silicula															
Ceratoneis sp.															
Cocconeis sp.															
Cocconeis placentula									X	X	X	X			
Cymbella sp.															
Cymbella affinis										X					
Cymbella ventricosa									X	X	X	X	X		
Cymbella tumida											X	X	X		
Cyclotella sp.															
Cyclotella meneghiniana															
Cymatopleura sp.															
Cymatopleura solea											X				
Deploneis sp.															
Diatoma sp.															
Diatoma vulgare									X				X		
Diatoma tenua var. *Elongatum*															
Eunotia sp.															
Eunotia pectinalis															
Fragilaria sp.															
Fragilaria crotonensis										X					
Fragilaria construens									X						

Table B-5-5 (Continued)
Station

L.S.L. TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
Frustulia sp.															
Gomphoneis sp.															
Gomphonema sp.															
Gomphonema olivaceum									X	X	X				
Gomphonema constrictum													X		
Gyrosigma sp.															
Gyrosigma acuminatum									X						
Hannaea arcus															
Melosira sp.															
Meridion sp.															
Meridion circulare															
Navicula sp.															
Navicula cryptocephala											X				
Navicula rhynochocephala									X		X				
Navicula viridula									X	X		X	X		
Nedium sp.															
Nitzschia sp.															
Nitzschia gracilis									X	X					
Nitzschia sigmoidea															
Nitzschia acicularis									X	X					
Nitzschia palea									X	X		X			
Nitzschia paleacea															
Pinnularia sp.															
Pinnularia viridis												X	X		
Rhoicosphenia sp.															
Rhoicosphenia curvata												X			
Rhopalodia sp.															
Stauroneis sp.															
Stephanodiscus hantzschii									X	X		X			
Surirella sp.															
Surirella ovata															
Synedra sp.															
Synedra ulna									X	X			X		
Synedra ulna var. *Impressa*															
Synedra rupens															
Tabellaria sp.															
CYANOPHYTA															
Agmenellum sp.															
Anabaena sp.															
Lyngbya sp.															
Lyngbya spirulinoidea															
Nodularia sp.															
Oscillatoria sp.															
Oscillatoria limnetica															
Oscillatoria limosa												X			
Phormidium sp.															
EUGLENOPHYCEAE															
Euglena acus															
TRACHEOPHYTA															
Naja sp.															
Ranuculus sp.															
Potamogeton sp.															
Mimulus sp.															
Rorippa sp.															
TOTAL NUMBER SPECIES/MONTH									17	15	9	11	11		

Table B-5-5 (Continued)
Station

W-1 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
CHLOROPHYCEAE															
Actinastrum sp.															
Cladophora sp.		X		X											
Chaetophora sp.															
Closterium sp.															
Closterium liebleinii								X							
Closterium lunula								X							
Closterium gracilis								X							
Cosmarium sp.															
Enteromorpha sp.		X													
Microspora sp.		X		X				X							
Pediastrum sp.															
Protococcus sp.															
Protococcus viridis															
Protoderma viride								X							
Scenedesmus sp.															
Spirogyra sp.															
Stigoclonium sp.															
Ulothrix sp.								X		X	X				
Ulothrix zonata								X	X						
Vaucheria sp.		X		X											
Zygnema sp.															
Draparnaldia sp.															
Unidentified Zygnemataceaen															
Unidentified Green Coccoid															
BACILLARIOPHYCEAE															
Achnanthes sp.															
Achnanthes lanceolata								X							
Achnanthes lanceolata var. *Dubia*								X							
Amphora sp.				X											
Amphora ovalis								X	X	X				X	X
Amphiphora ornata								X							
Asterionella sp.															
Caloneis sp.				X											
Caloneis amphisbaena								X	X					X	
Caloneis silicula															
Ceratoneis sp.		X													
Cocconeis sp.		X	X	X											
Cocconeis placentula								X	X	X	X				X
Cymbella sp.		X		X											
Cymbella affinis								X							
Cymbella ventricosa								X	X	X				X	
Cymbella tumida								X	X						
Cyclotella sp.															
Cyclotella meneghiniana								X							
Cymatopleura sp.															
Cymatopleura solea								X						X	
Deploneis sp.															
Diatoma sp.		X	X												
Diatoma vulgare								X	X						
Diatoma tenua var. *Elongatum*															
Eunotia sp.															
Eunotia pectinalis															
Fragilaria sp.		X	X	X											
Fragilaria crotonensis								X	X		X				
Fragilaria construens								X	X						

Table B-5-5 (Continued)
Station

W-1 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
Frustulia sp.		X	X	X											
Gomphoneis sp.															
Gomphonema sp.			X												
Gomphonema olivaceum								X	X	X					
Gomphonema constrictum								X	X		X			X	
Gyrosigma sp.		X	X	X											
Gyrosigma acuminatum								X	X		X			X	X
Hannaea arcus															
Melosira sp.															
Meridion sp.				X											
Meridion circulare								X						X	
Navicula sp.		X	X	X											
Navicula cryptocephala								X	X	X	X			X	X
Navicula rhynochocephala								X		X	X			X	X
Navicula viridula								X	X		X			X	
Nedium sp.															
Nitzschia sp.		X	X	X											
Nitzschia gracilis								X	X						
Nitzschia sigmoidea								X							
Nitzschia acicularis								X	X						
Nitzschia palea								X	X						
Nitzschia paleacea								X			X				
Pinnularia sp.			X	X											
Pinnularia viridis								X						X	
Rhoicosphenia sp.		X	X	X											
Rhoicosphenia curvata								X		X	X			X	X
Rhopalodia sp.															
Stauroneis sp.				X											
Stephanodiscus hantzschii														X	
Surirella sp.		X	X	X											
Surirella ovata								X	X					X	X
Synedra sp.								X	X		X			X	
Synedra ulna															
Synedra ulna var. *Impressa*															
Synedra rupens								X		X					
Tabellaria sp.		X	X	X											
CYANOPHYTA															
Agmenellum sp.		X													
Anabaena sp.								X							
Lyngbya sp.															
Lyngbya spirulinoidea															
Nodularia sp.															
Oscillatoria sp.								X							
Oscillatoria limnetica								X							
Oscillatoria limosa								X		X	X				
Phormidium sp.															
EUGLENOPHYCEAE															
Euglena acus															
TRACHEOPHYTA															
Naja sp.															
Ranuculus sp.															
Potamogeton sp.															
Mimulus sp.															
Rorippa sp.															
TOTAL NUMBER SPECIES/MONTH		17	12	19				42	19	10	12			15	7

Table B-5-5 (Continued)
Station

W-2 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
CHLOROPHYCEAE															
Actinastrum sp.															
Cladophora sp.															
Chaetophora sp.															
Closterium sp.															
Closterium liebleinii															
Closterium lunula															
Closterium gracilis															
Cosmarium sp.															
Enteromorpha sp.															
Microspora sp.															
Pediastrum sp.															
Protococcus sp.															
Protococcus viridis															
Protoderma viride															
Scenedesmus sp.															
Spirogyra sp.															
Stigoclonium sp.															
Ulothrix sp.															X
Ulothrix zonata															
Vaucheria sp.															
Zygnema sp.															
Draparnaldia sp.															
Unidentified Zygnemataceaen															
Unidentified Green Coccoid															
BACILLARIOPHYCEAE															
Achnanthes sp.															
Achnanthes lanceolata															
Achnanthes lanceolata var. *Dubia*															
Amphora sp.															
Amphora ovalis															
Amphiphora ornata															
Asterionella sp.															
Caloneis sp.															
Caloneis amphisbaena															
Caloneis silicula															
Ceratoneis sp.															
Cocconeis sp.															
Cocconeis placentula															X
Cymbella sp.															
Cymbella affinis															
Cymbella ventricosa															
Cymbella tumida															
Cyclotella sp.															
Cyclotella meneghiniana															
Cymatopleura sp.															
Cymatopleura solea															
Deploneis sp.															
Diatoma sp.															
Diatoma vulgare															
Diatoma tenua var. *Elongatum*															
Eunotia sp.															
Eunotia pectinalis															
Fragilaria sp.															
Fragilaria crotonensis															
Fragilaria construens															

Table B-5-5 (Continued)
Station

W-2 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
Frustulia sp.															
Gomphoneis sp.															
Gomphonema sp.															
Gomphonema olivaceum															X
Gomphonema constrictum															
Gyrosigma sp.															
Gyrosigma acuminatum															
Hannaea arcus															
Melosira sp.															
Meridion sp.															
Meridion circulare															
Navicula sp.															
Navicula cryptocephala															X
Navicula rhynochocephala															X
Navicula viridula															
Nedium sp.															
Nitzschia sp.															
Nitzschia gracilis															
Nitzschia sigmoidea															
Nitzschia acicularis															
Nitzschia palea															
Nitzschia paleacea															
Pinnularia sp.															
Pinnularia viridis															
Rhoicosphenia sp.															
Rhoicosphenia curvata															X
Rhopalodia sp.															
Stauroneis sp.															
Stephanodiscus hantzschii															
Surirella sp.															
Surirella ovata															X
Synedra sp.															
Synedra ulna															X
Synedra ulna var. *Impressa*															
Synedra rupens															
Tabellaria sp.															
CYANOPHYTA															
Agmenellum sp.															
Anabaena sp.															
Lyngbya sp.															
Lyngbya spirulinoidea															
Nodularia sp.															
Oscillatoria sp.															
Oscillatoria limnetica															
Oscillatoria limosa															
Phormidium sp.															
EUGLENOPHYCEAE															
Euglena acus															
TRACHEOPHYTA															
Naja sp.															
Ranuculus sp.															
Potamogeton sp.															
Mimulus sp.															
Rorippa sp.															
TOTAL NUMBER SPECIES/MONTH															8

Table B-5-5 (Continued)
Station

W-3 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
CHLOROPHYCEAE															
Actinastrum sp.			X	X											
Cladophora sp.		X							X						
Chaetophora sp.															
Closterium sp.															
Closterium liebleinii															
Closterium lunula															
Closterium gracilis								X							
Cosmarium sp.															
Enteromorpha sp.		X													
Microspora sp.								X							
Pediastrum sp.															
Protococcus sp.															
Protococcus viridis															
Protoderma viride								X	X	X				X	X
Scenedesmus sp.															
Spirogyra sp.		X													
Stigoclonium sp.															
Ulothrix sp.			X					X							
Ulothrix zonata								X	X	X	X	X			
Vaucheria sp.															
Zygnema sp.															
Draparnaldia sp.															
Unidentified Zygnemataceaen										X					
Unidentified Green Coccoid															
BACILLARIOPHYCEAE															
Achnanthes sp.															
Achnanthes lanceolata								X		X	X	X			
Achnanthes lanceolata var. *Dubia*															
Amphora sp.		X	X	X	X										
Amphora ovalis								X	X	X	X				X
Amphiphora ornata															
Asterionella sp.		X													
Caloneis sp.															
Caloneis amphisbaena								X	X						
Caloneis silicula															
Ceratoneis sp.															
Cocconeis sp.		X	X	X	X										
Cocconeis placentula								X	X	X	X	X	X	X	X
Cymbella sp.		X	X												
Cymbella affinis								X		X					
Cymbella ventricosa								X	X	X		X	X		
Cymbella tumida												X	X		
Cyclotella sp.		X													
Cyclotella meneghiniana															
Cymatopleura sp.				X											
Cymatopleura solea											X				
Deploneis sp.		X													
Diatoma sp.		X													
Diatoma vulgare								X	X				X		
Diatoma tenua var. *Elongatum*												X			
Eunotia sp.															
Eunotia pectinalis										X					
Fragilaria sp.		X	X	X	X										
Fragilaria crotonensis												X	X		
Fragilaria construens								X	X						

Table B-5-5 (Continued)
Station

W-3 TAXA		1974						1975					1976		
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
Frustulia sp.		X	X	X	X										
Gomphoneis sp.															
Gomphonema sp.		X	X												
Gomphonema olivaceum								X	X	X					X
Gomphonema constrictum										X	X	X	X		X
Gyrosigma sp.		X		X		X									
Gyrosigma acuminatum									X		X			X	
Hannaea arcus															
Melosira sp.															
Meridion sp.		X		X	X	X									
Meridion circulare															
Navicula sp.		X	X	X	X	X									
Navicula cryptocephala								X	X	X	X	X	X	X	X
Navicula rhynochocephala								X		X	X				X
Navicula viridula								X	X		X	X	X	X	X
Nedium sp.				X											
Nitzschia sp.		X	X	X											
Nitzschia gracilis									X						
Nitzschia sigmoidea															
Nitzschia acicularis								X			X				
Nitzschia palea								X	X	X	X				
Nitzschia paleacea								X							
Pinnularia sp.					X										
Pinnularia viridis				X				X		X	X			X	
Rhoicosphenia sp.		X	X			X									
Rhoicosphenia curvata										X	X	X			X
Rhopalodia sp.															
Stauroneis sp.					X	X									
Stephanodiscus hantzschii															X
Surirella sp.		X	X	X											
Surirella ovata								X	X						
Synedra sp.		X		X	X	X									
Synedra ulna								X	X	X	X	X	X	X	X
Synedra ulna var. *Impressa*															
Synedra rupens									X						
Tabellaria sp.		X	X	X		X					X				
CYANOPHYTA															
Agmenellum sp.															
Anabaena sp.								X	X		X				
Lyngbya sp.															
Lyngbya spirulinoidea															
Nodularia sp.															
Oscillatoria sp.								X							
Oscillatoria limnetica															
Oscillatoria limosa															
Phormidium sp.		X													
EUGLENOPHYCEAE															
Euglena acus															
TRACHEOPHYTA															
Naja sp.															
Ranunculus sp.															
Potamogeton sp.															
Mimulus sp.															
Rorippa sp.															
TOTAL NUMBER SPECIES/MONTH		22	13	15	9	7		25	19	17	17	12	9	8	11

Table B-5-5 (Continued)
Station

U.W.L. TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
CHLOROPHYCEAE															
Actinastrum sp.															
Cladophora sp.															
Chaetophora sp.															
Closterium sp.															
Closterium liebleinii															
Closterium lunula															
Closterium gracilis															
Cosmarium sp.															
Enteromorpha sp.															
Microspora sp.									X						
Pediastrum sp.															
Protococcus sp.															
Protococcus viridis															
Protoderma viride									X	X		X			X
Scenedesmus sp.															
Spirogyra sp.															
Stigoclonium sp.															
Ulothrix sp.									X				X		X
Ulothrix zonata												X	X	X	X
Vaucheria sp.															
Zygnema sp.															
Draparnaldia sp.															
Unidentified Zygnemataceaen															
Unidentified Green Coccoid															
BACILLARIOPHYCEAE															
Achnanthes sp.															
Achnanthes lanceolata												X			X
Achnanthes lanceolata var. *Dubia*															
Amphora sp.															
Amphora ovalis									X	X		X	X	X	X
Amphiphora ornata															
Asterionella sp.															
Caloneis sp.															
Caloneis amphisbaena															
Caloneis silicula															
Ceratoneis sp.															
Cocconeis sp.															
Cocconeis placentula									X	X	X	X	X	X	X
Cymbella sp.															
Cymbella affinis															X
Cymbella ventricosa										X		X	X	X	X
Cymbella tumida									X	X	X	X	X	X	X
Cyclotella sp.															
Cyclotella meneghiniana															
Cymatopleura sp.															
Cymatopleura solea															
Deploneis sp.															
Diatoma sp.															
Diatoma vulgare										X	X		X		
Diatoma tenua var. *Elongatum*									X						
Eunotia sp.															
Eunotia pectinalis															
Fragilaria sp.															
Fragilaria crotonensis									X	X	X	X	X	X	X
Fragilaria construens									X				X	X	

Table B-5-5 (Continued)
Station

U.W.L. TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
Frustulia sp.															
Gomphoneis sp.															
Gomphonema sp.															
Gomphonema olivaceum											X	X	X	X	X
Gomphonema constrictum									X	X	X		X		
Gyrosigma sp.															
Gyrosigma acuminatum															
Hannaea arcus															
Melosira sp.															
Meridion sp.															
Meridion circulare															
Navicula sp.															
Navicula cryptocephala									X		X				X
Navicula rhynochocephala															X
Navicula viridula									X	X	X				
Nedium sp.															
Nitzschia sp.															
Nitzschia gracilis													X	X	X
Nitzschia sigmoidea															
Nitzschia acicularis											X		X	X	
Nitzschia palea										X			X		
Nitzschia paleacea											X				
Pinnularia sp.															
Pinnularia viridis													X		X
Rhoicosphenia sp.															
Rhoicosphenia curvata										X					
Rhopalodia sp.															
Stauroneis sp.															
Stephanodiscus hantzschii													X	X	
Surirella sp.															
Surirella ovata															
Synedra sp.															
Synedra ulna									X		X	X	X	X	X
Synedra ulna var. *Impressa*															
Synedra rupens															
Tabellaria sp.															
CYANOPHYTA															
Agmenellum sp.															
Anahaena sp.									X						
Lyngbya sp.															
Lyngbya spirulinoidea															
Nodularia sp.															
Oscillatoria sp.															
Oscillatoria limnetica															
Oscillatoria limosa															
Phormidium sp.															
EUGLENOPHYCEAE															
Euglena acus															
TRACHEOPHYTA															
Naja sp.															
Ranuculus sp.															
Potamogeton sp.															
Mimulus sp.															
Rorippa sp.															
TOTAL NUMBER SPECIES/MONTH									14	11	11	10	17	12	16

Table B-5-5 (Continued)
Station

I.W.L. TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
CHLOROPHYCEAE															
Actinastrum sp.															
Cladophora sp.															
Chaetophora sp.															
Closterium sp.															
Closterium liebleinii															
Closterium lunula															
Closterium gracilis															
Cosmarium sp.															
Enteromorpha sp.															
Microspora sp.															
Pediastrum sp.															
Protococcus sp.															
Protococcus viridis															
Protoderma viride										X		X	X	X	
Scenedesmus sp.															
Spirogyra sp.															
Stigeoclonium sp.															
Ulothrix sp.										X	X			X	
Ulothrix zonata											X	X	X	X	X
Vaucheria sp.															
Zygnema sp.															
Draparnaldia sp.															
Unidentified Zygnemataceaen											X		X		
Unidentified Green Coccoid															
BACILLARIOPHYCEAE															
Achnanthes sp.															
Achnanthes lanceolata											X				
Achnanthes lanceolata var. *Dubia*															
Amphora sp.															
Amphora ovalis															X
Amphiphora ornata															
Asterionella sp.															
Caloneis sp.															
Caloneis amphisbaena										X				X	
Caloneis silicula															
Ceratoneis sp.															
Cocconeis sp.															
Cocconeis placentula											X	X	X		X
Cymbella sp.															
Cymbella affinis															
Cymbella ventricosa										X					
Cymbella tumida											X				X
Cyclotella sp.															
Cyclotella meneghiniana															
Cymatopleura sp.															
Cymatopleura solea															
Deploneis sp.															
Diatoma sp.															
Diatoma vulgare											X	X			X
Diatoma tenua var. *Elongatum*															
Eunotia sp.															
Eunotia pectinalis															
Fragilaria sp.															
Fragilaria crotonensis										X	X	X	X	X	X
Fragilaria construens															

Table B-5-5 (Continued)
Station

L.W.L. TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
Frustulia sp.															
Gomphoneis sp.															
Gomphonema sp.															
Gomphonema olivaceum										X		X	X	X	
Gomphonema constrictum											X	X	X	X	X
Gyrosigma sp.															
Gyrosigma acuminatum															
Hannaea arcus															
Melosira sp.															
Meridion sp.															
Meridion circulare															
Navicula sp.															
Navicula cryptocephala											X				
Navicula rhynochocephala											X				
Navicula viridula										X			X	X	X
Nedium sp.															
Nitzschia sp.															
Nitzschia gracilis													X		
Nitzschia sigmoidea															
Nitzschia acicularis										X					
Nitzschia palea													X		X
Nitzschia paleacea										X					
Pinnularia sp.															
Pinnularia viridis										X	X		X		
Rhoicosphenia sp.															
Rhoicosphenia curvata										X	X	X	X		X
Rhopalodia sp.															
Stauroneis sp.															
Stephanodiscus hantzschii															
Surirella sp.															
Surirella ovata															
Synedra sp.															
Synedra ulna										X		X	X		
Synedra ulna var. *Impressa*															
Synedra rupens													X		
Tabellaria sp.															
CYANOPHYTA															
Agmenellum sp.															
Anabaena sp.															
Lyngbya sp.															
Lyngbya spirulinoidea															
Nodularia sp.															
Oscillatoria sp.															
Oscillatoria limnetica															
Oscillatoria limosa															
Phormidium sp.															
EUGLENOPHYCEAE															
Euglena acus															
TRACHEOPHYTA															
Naja sp.															
Ranuculus sp.															
Potamogeton sp.															
Mimulus sp.															
Rorippa sp.															
TOTAL NUMBER SPECIES/MONTH										12	13	9	13	8	10

Table B-5-5 (Continued)
Station

WR-1 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
CHLOROPHYCEAE															
Actinastrum sp.															
Cladophora sp.				X											
Chaetophora sp.				X											
Closterium sp.															
Closterium liebleinii															
Closterium lunula															
Closterium gracilis															
Cosmarium sp.				X											
Enteromorpha sp.															
Microspora sp.															
Pediastrum sp.															
Protococcus sp.															
Protococcus viridis															
Protoderma viride										X					
Scenedesmus sp.															
Spirogyra sp.				X											
Stigoclonium sp.															
Ulothrix sp.		X	X	X						X					
Ulothrix zonata															
Vaucheria sp.															
Zygnema sp.															
Draparnaldia sp.															
Unidentified Zygnemataceaen															
Unidentified Green Coccoid															
BACILLARIOPHYCEAE															
Achnanthes sp.															
Achnanthes lanceolata															
Achnanthes lanceolata var. *Dubia*															
Amphora sp.		X	X	X											
Amphora ovalis										X	X				
Amphiphora ornata															
Asterionella sp.		X													
Caloneis sp.			X	X											
Caloneis amphisbaena														X	
Caloneis silicula										X					
Ceratoneis sp.				X											
Cocconeis sp.		X	X	X											
Cocconeis placentula										X	X			X	
Cymbella sp.		X	X	X											
Cymbella affinis											X				
Cymbella ventricosa										X	X				
Cymbella tumida											X			X	
Cyclotella sp.		X													
Cyclotella meneghiniana															
Cymatopleura sp.															
Cymatopleura solea															
Deploneis sp.															
Diatoma sp.		X	X												
Diatoma vulgare										X	X				
Diatoma tenua var. *Elongatum*															
Eunotia sp.		X													
Eunotia pectinalis															
Fragilaria sp.		X	X												
Fragilaria crotonensis											X				
Fragilaria construens															

Table B-5-5 (Continued)
Station

WR-1 TAXA	1974 AUG	1974 SEP	1974 OCT	1974 NOV	1974 DEC	1975 JAN	1975 MAR	1975 MAY	1975 JUL	1975 SEP	1975 NOV	1976 JAN	1976 MAR	1976 MAY	1976 JUL
Frustulia sp.		X	X												
Gomphoneis sp.				X											
Gomphonema sp.		X	X	X											
Gomphonema olivaceum										X					
Gomphonema constrictum										X	X			X	
Gyrosigma sp.		X	X	X											
Gyrosigma acuminatum											X				
Hannaea arcus															
Melosira sp.															
Meridion sp.		X	X												
Meridion circulare															
Navicula sp.		X	X	X											
Navicula cryptocephala											X			X	
Navicula rhynochocephala										X	X				
Navicula viridula											X			X	
Nedium sp.															
Nitzschia sp.		X	X	X											
Nitzschia gracilis											X			X	
Nitzschia sigmoidea															
Nitzschia acicularis										X	X				
Nitzschia palea										X					
Nitzschia paleacea										X					
Pinnularia sp.		X		X											
Pinnularia viridis										X	X				
Rhoicosphenia sp.			X												
Rhoicosphenia curvata															
Rhopalodia sp.			X												
Stauroneis sp.															
Stephanodiscus hantzschii											X			X	
Surirella sp.		X	X												
Surirella ovata															
Synedra sp.		X	X	X											
Synedra ulna										X	X			X	
Synedra ulna var. *Impressa*															
Synedra rupens										X					
Tabellaria sp.			X	X											
CYANOPHYTA															
Agmenellum sp.		X													
Anabaena sp.															
Lyngbya sp.															
Lyngbya spirulinoidea															
Nodularia sp.															
Oscillatoria sp.															
Oscillatoria limnetica															
Oscillatoria limosa															
Phormidium sp.		X													
EUGLENOPHYCEAE															
Euglena acus															
TRACHEOPHYTA															
Naja sp.															
Ranuculus sp.															
Potamogeton sp.															
Mimulus sp.															
Rorippa sp.															
TOTAL NUMBER SPECIES/MONTH		20	18	18						16	17			9	

Table B-5-5 (Continued)
Station

WR-2 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
CHLOROPHYCEAE															
Actinastrum sp.		X													
Cladophora sp.															
Chaetophora sp.															
Closterium sp.				X											
Closterium liebleinii															
Closterium lunula															
Closterium gracilis															
Cosmarium sp.		X													
Enteromorpha sp.															
Microspora sp.															
Pediastrum sp.															
Protococcus sp.															
Protococcus viridis															
Protoderma viride										X					
Scenedesmus sp.															
Spirogyra sp.															
Stigoclonium sp.															
Ulothrix sp.				X											
Ulothrix zonata														X	
Vaucheria sp.															
Zygnema sp.															
Draparnaldia sp.															
Unidentified Zygnemataceaen															
Unidentified Green Coccoid															
BACILLARIOPHYCEAE															
Achnanthes sp.															
Achnanthes lanceolata															
Achnanthes lanceolata var. *Dubia*															
Amphora sp.		X	X	X											
Amphora ovalis										X	X			X	
Amphiphora ornata															
Asterionella sp.															
Caloneis sp.		X	X												
Caloneis amphisbaena											X			X	
Caloneis silicula															
Ceratoneis sp.				X											
Cocconeis sp.		X	X	X											
Cocconeis placentula										X	X			X	
Cymbella sp.			X	X											
Cymbella affinis											X				
Cymbella ventricosa										X					
Cymbella tumida															
Cyclotella sp.															
Cyclotella meneghiniana															
Cymatopleura sp.				X											
Cymatopleura solea											X				
Deploneis sp.															
Diatoma sp.		X		X											
Diatoma vulgare										X	X				
Diatoma tenua var. *Elongatum*															
Eunotia sp.															
Eunotia pectinalis															
Fragilaria sp.		X	X							X				X	
Fragilaria crotonensis															
Fragilaria construens															

Table B-5-5 (Continued)
Station

WR-2 TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
Frustulia sp.		X	X	X											
Gomphoneis sp.			X	X											
Gomphonema sp.		X	X	X											
Gomphonema olivaceum										X	X				
Gomphonema constrictum										X	X			X	
Gyrosigma sp.		X	X	X											
Gyrosigma acuminatum											X			X	
Hannaea arcus															
Melosira sp.															
Meridion sp.				X											
Meridion circulare															
Navicula sp.		X	X	X											
Navicula cryptocephala											X			X	
Navicula rhynochocephala										X					
Navicula viridula										X	X			X	
Nedium sp.															
Nitzschia sp.		X		X											
Nitzschia gracilis										X	X				
Nitzschia sigmoidea															
Nitzschia acicularis										X					
Nitzschia palea										X	X				
Nitzschia paleacea															
Pinnularia sp.				X											
Pinnularia viridis											X				
Rhoicosphenia sp.		X	X	X											
Rhoicosphenia curvata															
Rhopalodia sp.		X	X												
Stauroneis sp.		X													
Stephanodiscus hantzschii															
Surirella sp.		X	X												
Surirella ovata														X	
Synedra sp.		X	X	X											
Synedra ulna										X	X			X	
Synedra ulna var. *Impressa*															
Synedra rupens															
Tabellaria sp.			X	X							X				
CYANOPHYTA															
Agmenellum sp.															
Anabaena sp.											X				
Lyngbya sp.															
Lyngbya spirulinoidea															
Nodularia sp.															
Oscillatoria sp.															
Oscillatoria limnetica															
Oscillatoria limosa															
Phormidium sp.															
EUGLENOPHYCEAE															
Euglena acus															
TRACHEOPHYTA															
Naja sp.															
Ranuculus sp.															
Potamogeton sp.															
Mimulus sp.															
Rorippa sp.															
TOTAL NUMBER SPECIES/MONTH		17	15	19						14	17			11	

Table B-5-6 BENTHIC INVERTEBRATES COLLECTED FROM PICEANCE, WILLOW, AND STEWART CREEKS AND THE WHITE RIVER, AUGUST 1974 - JULY 1976

Scientific Name	Common Name
PLATYHELMINTHES	
Turbellaria	Flatworms
Tricladida	
Planariidae	
Polycelis	
ANNELIDA	
Oligochaeta	Aquatic earthworms
Microdrili**	
Hirudinea	Leeches
Helobdella**	
ARTHROPODA	
Insecta	
Collembola	Springtails
Isotomidae	
Isotomurus	
Ephemeroptera	Mayflies
Baetidae	
Choroterpes	
Callibaetis c.f.	
Baetis	
Tricorythodes	
Ephemerella	
Heptageniidae	
Heptagenia	
Rhithrogena	
Stenonema	
Odonata	Damselflies & Dragonflies
Gomphidae	

Table B-5-6 (Continued)

Scientific Name	Common Name
Ophiogomphus	
Gomphus	
Coenagrionidae	
Amphiagrion	
Ischnura	
Aeschnidae	
Aeschna	
Libellulidae	
Leucorrhinia	
Plecoptera	Stoneflies
Nemouridae	
? — *Capiinae*	
? — *Taeniopteryginae*	
*Nemoura***	
Perlodidae	
Isogenus	
Isoperla	
Hemiptera	True bugs
Notonectidae	
Notonecta	
Corixidae	
Trichocorixa	
? — *Corixinae*	
Homoptera	Aphids*
Aphididae	
Cicadellidae*	

Table B-5-6 (Continued)

Scientific Name	Common Name
Fulgoridae	
Coleoptera	Beetles
Gyrinidae	
Gyrinus	
Dryopidae	
Helichus	
Throscinus	
Dytiscidae	
Ilybius	
Eretes	
Agabus	
Agabinus	
Hydroporus	
Copelatus	
Hygrotus	
Elmidae	
Neoelmis	
Optioservus	
Ancyronyx	
Heterlimnius	
Stenelmis	
Hydrophilidae	
Hydrophilinae	
Helophorus	
Paracymus	
Haliplidae	
Peltodytes	
Haliplus	
Curculionidae	
Hyperodes	
Chrysomelidae	

Table B-5-6 (Continued)

Scientific Name	Common Name
Trichoptera	Caddisflies
Rhyacophilidae	
Glossosoma	
Rhyacophila	
Brachycentridae	
Brachycentrus	
Micrasema	
Hydropsychidae	
Hydropsyche	
? *Macronemum*	
Hydroptilidae	
Hydroptila	
Psychomyiidae	
Polycentropus	
Psychomyia	
Molannidae	
Molanna	
Limnephilidae	
Hesperophylax	
Lepidoptera	Aquatic caterpillars
Pyralidae	
Diptera	True flies
Anthomyiidae	
Limnophora	
Ceratopogonidae	

Table B-5-6 (Continued)

Scientific Name	Common Name
Chironomidae	
Sp. 1	
Sp. 2	
Sp. 3	
Pentaneura	
*Diamesa***	
*Orthocladius***	
*Tribelos***	
*Cricotopus***	
Deuterophlebiidae	
Deuterophlebia	
Dixidae	
Dixa	
Rhagionidae	
Atherix	
Simuliidae	
Stratiomyiidae	
Odontomyia	
Eupharyphus	
Nemotelus	
Psychodidae	
Psychoda	
Tabanidae	
Chrysops	
Tipulidae	
Erioptera	
Hexatoma	
c.f. Pedicia	
Tipula	

Table B-5-6 (Concluded)

Scientific Name	Common Name
Culicidae	
Culex	
? — Syrphidae - Table 5.5-3.2	
Ephydridae	
Crustacea	
Amphipoda	Scuds
Gammaridae	
Gammarus	
Talitridae	
Hyalella	
Hydracarina	Water mites
MOLLUSCA	
Gastropoda	Snails
Pulmonata	
Physidae	
Physa	
Lymnaeidae	
Lymnaea	
Planorbidae	
Pelecypoda	Clams
Sphaeriidae	
Pisidium	

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* Terrestrial Insects
** Only collected at Springs and Seeps

Table B-5-7 NUMBER OF BENTHIC INVERTEBRATES COLLECTED FROM PICEANCE BASIN STATIONS (AVERAGE OF 3 REPLICATES) FROM AUGUST 1974 - JULY 1976

Station P-1

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
COLLEMBOLA															
Isotomurus															
EPHEMEROPTERA															
Callibaetis c.f.								1							
Baetis	3	5	24	26	31		6	1	43	27	5	38	1	2	56
Tricorythodes															6
Ephemerella				6			2		2			4	4	23	1
Heptagenia															2
Rhithrogena															
Stenonema															
ODONATA															
Ophiogomphus															
Gomphus															
Amphiagrion															
Ischnura															
Aeschna															
Leucorrhinia															
PLECOPTERA															
Capniinae															
Taeniopteryginae															
Isogenus															
Isoperla			1	1			2				1	3	1	11	1
HEMIPTERA															
Notonecta															
Corixidae															
Trichocorixa															
Corixinae															
HOMOPTERA															
Aphididae		1													
Cicadellidae															
Fulgoridae															
COLEOPTERA															
Gyrinus		1													
Helichus	1														
Throscinus															
Ilybius															
Eretes															
Agabus															
Agabinus									1						
Hydroporus															
Copelatus															
Hygrotus															
Neoelmis															
Optioservus	13											1			10
Ancyronyx		1													
Heterlimnius				1					1	1	1		1	3	
Stenelmis				1										1	
Helophorus															
Paracymus															
Peltodytes															
Haliplus															
Hyperodes															
Chrysomelidae															

Table B-5-7 (Continued)

Station P-1

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
TRICHOPTERA															
Glossosoma															
Rhyacophila															
Brachycentrus															
Micrasema															
Hydropsyche										1	1	1		1	5
Macronemum															
Hydroptila	1									2					
Polycentropus															
Psychomyia															
Molanna															
Hesperophylax															
LEPIDOPTERA															
Pyralididae															
DIPTERA															
Limnophora	1			1		2	1			1	2	1	1	1	1
Deuterophlebia															
Dixa															
Atherix							1	1					1		
Odontomyia										1				1	
Euparyphus								1					1		
Nemotelus															
Psychoda												1			
Chrysops															
Culex											1				
Tipulidae				2											
Erioptera															
Hexatoma											1				
c.f. *Pedicia*												1			1
Tipula										1		1	1	1	2
Simuliidae	1	2	6	13	1	1			1	4		2			1
Ceratopogonidae											1	1	1		1
Chironomidae	4	18	7	83	14	21	23	1	27					2	
Sp. 1	47											4			3
Sp. 2	10														
Sp. 3										9	1		1		
Pentaneura										1					
AMPHIPODA															
Gammarus												1		1	1
Hyalella															
HYDRACARINA															2
PULMONATA															
Physa	1												1		
Lymnaea	1														
Planorbidae															
PELECYPODA															
Sphaeridae															
HIRUDINEA	1	1	1	1		1				1	2	1	1	3	8
OLIGOCHAETA	13	1		27	2	19	5	9	21	5	63	12	6	21	36
Tabanidae[1]															
Ephydridae[1]															
Hydrophilinae[2]															
Choroterpes[3]															

Table B-5-7 (Continued)

Station P-2

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
COLLEMBOLA															
Isotomurus								1							
EPHEMEROPTERA															
Callibaetis c.f.												1			
Baetis	9	31	6	7	4	19	72	4	13	9	1	6	12	3	1
Tricorythodes															
Ephemerella					1	1	9	14	3			1	1	11	1
Heptagenia															
Rhithrogena															
Stenonema															
ODONATA															
Ophiogomphus															
Gomphus															
Amphiagrion															
Ischnura															
Aeschna															
Leucorrhinia															
PLECOPTERA															
Capniinae															
Taeniopteryginae															
Isogenus															
Isoperla					1	1	3					1	1	1	
HEMIPTERA															
Notonecta															
Corixidae															
Trichocorixa															
Corixinae															
HOMOPTERA								1							
Aphididae															
Cicadellidae															
Fulgoridae								1							
COLEOPTERA															
Gyrinus															
Helichus															
Throscinus															
Ilybius															
Eretes															
Agabus															
Agabinus															
Hydroporus															
Copelatus															
Hygrotus															
Neoelmis															
Optioservus	14											2			
Ancyronyx									1						
Heterlimnius					1						1			1	
Stenelmis										1				1	
Helophorus															
Paracymus															
Peltodytes															
Haliplus										1					
Hyperodes															
Chrysomelidae															

Table B-5-7 (Continued)

Station P-2

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
TRICHOPTERA															
Glossosoma															
Rhyacophila															
Brachycentrus															
Micrasema															
Hydropsyche		1				1	1							1	
Macronemum															
Hydroptila	1														
Polycentropus															
Psychomyia															
Molanna															
Hesperophylax															
LEPIDOPTERA															
Pyralididae															
DIPTERA															
Limnophora			1	I	2	I				1	1	3			
Deuterophlebia															
Dixa															
Atherix							1								
Odontomyia															
Euparyphus								1							
Nemotelus								1							
Psychoda															
Chrysops															
Culex															
Tipulidae		1		1	1	1									
Erioptera															
Hexatoma							1		1	1			1	1	
c.f. *Pedicia*												1			
Tipula										1	1	1		1	
Simuliidae	12	2	9	2	1	1	7			8	1	2	1		1
Ceratopogonidae									1			1			
Chironomidae	13	5	1	4	66	17	10	I							
Sp. 1	58								95			4			1
Sp. 2	20								2						
Sp. 3										3	1				
Pentaneura										I					
AMPHIPODA															
Gammarus						1	1			1					
Hyalella															
HYDRACARINA															1
PULMONATA															
Physa		1								1					
Lymnaea				1									1	1	
Planorbidae															
PELECYPODA															
Sphaeridae															
HIRUDINEA	1	1					1	1				1	1		1
OLIGOCHAETA	37	3	1	43	46		2	12	48		17	262	25	16	3
Tabanidae[1]															
Ephydridae[1]															
Hydrophilinae[2]															
Choroterpes[3]															

Table B-5-7 (Continued)

Station P-3

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
COLLEMBOLA															
Isotomurus								1							
EPHEMEROPTERA															
Callibaetis c.f.															
Baetis	11	32	50	13	7	57	66	3	45	10	10	9	31		22
Tricorythodes												1			
Ephemerella				3	1	2	3	1				4	7	13	
Heptagenia															
Rhithrogena															
Stenonema									1						
ODONATA															
Ophiogomphus															
Gomphus															
Amphiagrion															
Ischnura															
Aeschna															
Leucorrhinia															
PLECOPTERA															
Capniinae															
Taeniopteryginae															
Isogenus															
Isoperla			1	2	1	9	8	1		1	5	13	2	22	1
HEMIPTERA															
Notonecta															
Corixidae															
Trichocorixa															
Corixinae															
HOMOPTERA															
Aphididae															
Cicadellidae															
Fulgoridae															
COLEOPTERA															
Gyrinus															
Helichus	1	1													
Throscinus															
Ilybius															
Eretes															
Agabus															
Agabinus					1										1
Hydroporus															
Copelatus															
Hygrotus															
Neoelmis															
Optioservus	13												1		4
Ancyronyx									3						
Heterlimnius				2		2			1	1	2			4	
Stenelmis							1							1	
Helophorus															
Paracymus															
Peltodytes															
Haliplus															
Hyperodes															
Chrysomelidae															

Table B-5-7 (Continued)

Station P-3

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
TRICHOPTERA															
Glossosoma															
Rhyacophila															
Brachycentrus															
Micrasema															
Hydropsyche			5	1										4	1
Macronemum															
Hydroptila										1					
Polycentropus															
Psychomyia															
Molanna															
Hesperophylax															
LEPIDOPTERA															
Pyralididae															
DIPTERA															
Limnophora			1	1	1	1		1		2	3	1	1		1
Deuterophlebia															
Dixa															
Atherix											1				
Odontomyia				1											
Euparyphus													1		1
Nemotelus								1							
Psychoda															
Chrysops															
Culex	1														
Tipulidae			2	1											
Erioptera															
Hexatoma															
c.f. *Pedicia*												1			
Tipula							1				1	1	1	3	
Simuliidae	12	11	22	1	4	3	5	1	1	24	6	1	1		9
Ceratopogonidae				1	1							1			
Chironomidae	11	15	7	14	16	58	7								
Sp. 1	107								26			1	1		26
Sp. 2	14											1			
Sp. 3									27	4	2	1			
Pentaneura															
AMPHIPODA															
Gammarus		1					1				1	1		1	1
Hyalella				1											
HYDRACARINA	1														2
PULMONATA															
Physa												2	1		
Lymnaea				1											
Planorbidae														1	
PELECYPODA															
Sphaeridae															
HIRUDINEA	1			3			1		1	1	1			2	3
OLIGOCHAETA	5	5	1	51	13		2	6			2	5	20	1	5
Tabanidae[1]				1	1										
Ephydridae[1]															
Hydrophilinae[2]															
Choroterpes[3]															

Table B-5-7 (Continued)

Station P-4

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
COLLEMBOLA															
Isotomurus															
EPHEMEROPTERA															
Callibaetis c.f.															
Baetis	13	19	29	7											
Tricorythodes															
Ephemerella															
Heptagenia															
Rhithrogena															
Stenonema															
ODONATA															
Ophiogomphus															
Gomphus															
Amphiagrion															
Ischnura															
Aeschna															
Leucorrhinia															
PLECOPTERA															
Capniinae															
Taeniopteryginae															
Isogenus		1													
Isoperla				1											
HEMIPTERA															
Notonecta															
Corixidae															
Trichocorixa															
Corixinae															
HOMOPTERA															
Aphididae															
Cicadellidae															
Fulgoridae															
COLEOPTERA															
Gyrinus															
Helichus															
Throscinus															
Ilybius															
Eretes															
Agabus															
Agabinus															
Hydroporus															
Copelatus															
Hygrotus															
Neoelmis															
Optioservus	7														
Ancyronyx															
Heterlimnius															
Stenelmis															
Helophorus															
Paracymus															
Peltodytes															
Haliplus			1												
Hyperodes															
Chrysomelidae															

Table B-5-7 (Continued)

Station P-4

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
TRICHOPTERA															
Glossosoma															
Rhyacophila															
Brachycentrus															
Micrasema															
Hydropsyche		9	2												
Macronemum				1											
Hydroptila															
Polycentropus															
Psychomyia															
Molanna		1													
Hesperophylax															
LEPIDOPTERA															
Pyralididae															
DIPTERA															
Limnophora		3		1											
Deuterophlebia															
Dixa															
Atherix															
Odontomyia		1													
Euparyphus															
Nemotelus															
Psychoda															
Chrysops															
Culex															
Tipulidae		1													
Erioptera															
Hexatoma															
c.f. *Pedicia*															
Tipula	1														
Simuliidae	2	13	3	1											
Ceratopogonidae				1											
Chironomidae	2	6	1	5											
Sp. 1	17														
Sp. 2	4														
Sp. 3															
Pentaneura															
AMPHIPODA															
Gammarus															
Hyalella															
HYDRACARINA															
PULMONATA															
Physa															
Lymnaea															
Planorbidae															
PELECYPODA															
Sphaeridae															
HIRUDINEA	1	2	1												
OLIGOCHAETA	15	1	1	1											
Tabanidae[1]															
Ephydridae[1]															
Hydrophilinae[2]															
Choroterpes[3]															

Table B-5-7 (Continued)

Station P-5

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
COLLEMBOLA															
Isotomurus															
EPHEMEROPTERA															
Callibaetis c.f.								1				1			
Baetis	15	22	20	45	6	34	24	3	27	17	3	2	24	5	8
Tricorythodes								1	3	1		1			1
Ephemerella				1		1	3	5	4		1	7	3	14	
Heptagenia															
Rhithrogena															
Stenonema															
ODONATA															
Ophiogomphus															
Gomphus															
Amphiagrion															
Ischnura															
Aeschna															
Leucorrhinia															
PLECOPTERA															
Capniinae															
Taeniopteryginae															
Isogenus															
Isoperla			1	1		6	2			1	1	17	10	9	
HEMIPTERA															
Notonecta															
Corixidae															
Trichocorixa															
Corixinae															
HOMOPTERA															
Aphididae		1													
Cicadellidae															
Fulgoridae															
COLEOPTERA															
Gyrinus															
Helichus		1													
Throscinus															
Ilybius															
Eretes															
Agabus															
Agabinus							1								
Hydroporus															
Copelatus															
Hygrotus															
Neoelmis							1								
Optioservus	2											4	1		1
Ancyronyx		2	1												
Heterlimnius				2					1	1	1		2	2	
Stenelmis				1										1	
Helophorus															
Paracymus															
Peltodytes															
Haliplus															
Hyperodes												1			
Chrysomelidae															

Table B-5-7 (Continued)

Station P-5

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
TRICHOPTERA															
Glossosoma															
Rhyacophila															
Brachycentrus															
Micrasema												1			
Hydropsyche		11	3									1	1	4	
Macronemum															
Hydroptila															
Polycentropus															
Psychomyia															
Molanna															
Hesperophylax											1		1		
LEPIDOPTERA															
Pyralididae															
DIPTERA															
Limnophora					1	1					1	1	1		1
Deuterophlebia															
Dixa															
Atherix															
Odontomyia															
Euparyphus												1			
Nemotelus															
Psychoda															
Chrysops															
Culex	1														
Tipulidae				1											
Erioptera															
Hexatoma							1		1			1			
c.f. *Pedicia*												2	1		
Tipula							2	1		1	1	1	2	2	1
Simuliidae	3	6	7	49	2	4	1		1	11		3	1		1
Ceratopogonidae												1			1
Chironomidae	16	5	2	11	5	14	10					11			
Sp. 1	43								107				1		1
Sp. 2	16								2				1		
Sp. 3									8				1	1	
Pentaneura															
AMPHIPODA															
Gammarus		1	1			1	1	1				1	1		1
Hyalella						1									
HYDRACARINA		2							1	1			1		
PULMONATA															
Physa				2										1	
Lymnaea	1	1		1											
Planorbidae															
PELECYPODA															
Sphaeridae															
HIRUDINEA	1	2	1			1	1		1	3	2	1	1	1	1
OLIGOCHAETA	8	6	1		5	14	1	15	24	3	6	13	5	1	12
Tabanidae[1]															
Ephydridae[1]															
Hydrophilinae[2]															
Choroterpes[3]															

Table B-5-7 (Continued)

Station P-5A

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
COLLEMBOLA															
Isotomurus								1							
EPHEMEROPTERA															
Callibaetis c.f.								1							
Baetis				17	3	4	35	5	5	33		6	24	4	7
Tricorythodes				1								1			2
Ephemerella				3	1		9	10	14			2	2	1	
Heptagenia															
Rhithrogena															
Stenonema															
ODONATA															
Ophiogomphus															
Gomphus															
Amphiagrion															
Ischnura															
Aeschna															
Leucorrhinia															
PLECOPTERA															
Capniinae															
Taeniopteryginae															
Isogenus															
Isoperla							5	6	1	1		2	3		
HEMIPTERA															
Notonecta															
Corixidae															
Trichocorixa															
Corixinae															
HOMOPTERA															
Aphididae															
Cicadellidae										1					
Fulgoridae															
COLEOPTERA															
Gyrinus															
Helichus															
Throscinus															
Ilybius															
Eretes															
Agabus															
Agabinus															1
Hydroporus															
Copelatus															
Hygrotus															
Neoelmis															
Optioservus								1	1						2
Ancyronyx									1						
Heterlimnius				1					1						
Stenelmis															
Helophorus															
Paracymus															
Peltodytes															
Haliplus															1
Hyperodes															
Chrysomelidae															

Table B-5-7 (Continued)

Station P-5A

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
TRICHOPTERA															
Glossosoma															
Rhyacophila															
Brachycentrus															
Micrasema															
Hydropsyche								1							
Macronemum															
Hydroptila										1					
Polycentropus															
Psychomyia															
Molanna															
Hesperophylax															
LEPIDOPTERA															
Pyralididae															
DIPTERA															
Limnophora					1			1			1		1		1
Deuterophlebia															
Dixa															
Atherix															
Odontomyia															
Euparyphus															
Nemotelus															
Psychoda															
Chrysops															
Culex															
Tipulidae				1											
Erioptera															
Hexatoma								1			1				
c.f. *Pedicia*												1			
Tipula							3	1							1
Simuliidae				1	1		1		1	1					
Ceratopogonidae								1							1
Chironomidae				23	26	1	10	1							
Sp. 1									22				3		14
Sp. 2															1
Sp. 3									74		1			1	
Pentaneura															
AMPHIPODA															
Gammarus															1
Hyalella															
HYDRACARINA									1						1
PULMONATA															
Physa															1
Lymnaea				1						1				1	
Planorbidae														1	
PELECYPODA															
Sphaeridae															
HIRUDINEA				1			1	1			1	1			4
OLIGOCHAETA				157	3	1	2	5		3	14	2	1		21
Tabanidae[1]															
Ephydridae[1]															
Hydrophilinae[2]															
Choroterpes[3]															

Table B-5-7 (Continued)

Station P-6

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
COLLEMBOLA															
Isotomurus								1							
EPHEMEROPTERA															
Callibaetis c.f.					1										
Baetis	18	12	7	1	1	16	16	6		20			2	1	6
Tricorythodes	1														1
Ephemerella					1			3	1				1	1	
Heptagenia															
Rhithrogena															
Stenonema															
ODONATA															
Ophiogomphus															
Gomphus															
Amphiagrion															
Ischnura															
Aeschna															
Leucorrhinia															
PLECOPTERA															
Capniinae															
Taeniopteryginae															
Isogenus															
Isoperla					1		1			1				1	1
HEMIPTERA															
Notonecta															
Corixidae															
Trichocorixa															
Corixinae															
HOMOPTERA															
Aphididae															
Cicadellidae															
Fulgoridae															
COLEOPTERA															
Gyrinus															
Helichus															
Throscinus															
Ilybius															
Eretes															
Agabus	1														
Agabinus															1
Hydroporus															
Copelatus															
Hygrotus															
Neoelmis															
Optioservus	1														
Ancyronyx															
Heterlimnius														1	
Stenelmis															
Helophorus															
Paracymus															
Peltodytes															
Haliplus															
Hyperodes															
Chrysomelidae															

Table B-5-7 (Continued)

Station P-6

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
TRICHOPTERA															
Glossosoma															
Rhyacophila															
Brachycentrus															
Micrasema															
Hydropsyche															
Macronemum															
Hydroptila															
Polycentropus															
Psychomyia															
Molanna															
Hesperophylax														1	
LEPIDOPTERA															
Pyralididae															
DIPTERA															
Limnophora						1					2				1
Deuterophlebia															
Dixa															
Atherix															
Odontomyia															
Euparyphus															
Nemotelus															
Psychoda															
Chrysops															
Culex															
Tipulidae		1	1	1		1									
Erioptera								1							
Hexatoma	1												1	1	
c.f. *Pedicia*								1							
Tipula											1			1	1
Simuliidae	4									1					1
Ceratopogonidae								1							1
Chironomidae	5	1		2	1	1	1								
Sp. 1	66								32						25
Sp. 2	8								2	1					3
Sp. 3											1				
Pentaneura															
AMPHIPODA															
Gammarus								1							
Hyalella															
HYDRACARINA	1														1
PULMONATA															
Physa														1	
Lymnaea		1												1	
Planorbidae															
PELECYPODA															
Sphaeridae															
HIRUDINEA			1			1	1				1			1	1
OLIGOCHAETA	51	15	1	36	4	5	3	23	33	3	29		10	8	54
Tabanidae[1]															
Ephydridae[1]															
Hydrophilinae[2]															
Choroterpes[3]															

Table B-5-7 (Continued)

Station P-7

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
COLLEMBOLA															
Isotomurus															
EPHEMEROPTERA															
Callibaetis c.f.					1										
Baetis			1			2	11	2	1	2			8	1	
Tricorythodes									1						2
Ephemerella											1		1	1	
Heptagenia															
Rhithrogena									1						
Stenonema															
ODONATA															
Ophiogomphus										1					1
Gomphus														1	
Amphiagrion															
Ischnura															
Aeschna									1						
Leucorrhinia															
PLECOPTERA															
Capniinae															
Taeniopteryginae															
Isogenus															
Isoperla							2							1	
HEMIPTERA															
Notonecta															
Corixidae															
Trichocorixa															
Corixinae															
HOMOPTERA				1											
Aphididae															
Cicadellidae															
Fulgoridae															
COLEOPTERA															
Gyrinus															
Helichus															
Throscinus															
Ilybius															
Eretes															
Agabus															
Agabinus															
Hydroporus															
Copelatus															
Hygrotus															
Neoelmis															
Optioservus															
Ancyronyx															
Heterlimnius															
Stenelmis															
Helophorus															
Paracymus															
Peltodytes															
Haliplus															
Hyperodes															
Chrysomelidae															

Table B-5-7 (Continued)

Station P-7

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
TRICHOPTERA															
Glossosoma															
Rhyacophila															
Brachycentrus															
Micrasema															
Hydropsyche															
Macronemum															
Hydroptila															
Polycentropus															
Psychomyia															
Molanna															
Hesperophylax															
LEPIDOPTERA															
Pyralididae															
DIPTERA															
Limnophora						1									
Deuterophlebia															
Dixa															
Atherix															
Odontomyia															
Euparyphus															
Nemotelus															
Psychoda															
Chrysops															
Culex															
Tipulidae				1		1									
Erioptera															
Hexatoma													1		
c.f. *Pedicia*															
Tipula															
Simuliidae															
Ceratopogonidae								1							
Chironomidae		1	4	5	1	1	1	5							
Sp. 1									2	1			1		9
Sp. 2															1
Sp. 3											1			1	
Pentaneura															
AMPHIPODA															
Gammarus															
Hyalella															
HYDRACARINA															1
PULMONATA															
Physa															
Lymnaea															
Planorbidae															
PELECYPODA															
Sphaeridae															
HIRUDINEA															
OLIGOCHAETA		10	3	5	1	3	13	25	32	4	18		8	12	111
Tabanidae[1]															
Ephydridae[1]															
Hydrophilinae[2]															
Choroterpes[3]															

Table B-5-7 (Continued)

Station S-1

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
COLLEMBOLA															
Isotomurus															
EPHEMEROPTERA															
Callibaetis c.f.															
Baetis	6	8	5	1	6		19	11	3	13	16	7	1	2	50
Tricorythodes															
Ephemerella							3	32	3			3		12	1
Heptagenia															
Rhithrogena															
Stenonema															
ODONATA															
Ophiogomphus															
Gomphus															
Amphiagrion															
Ischnura															
Aeschna															
Leucorrhinia															
PLECOPTERA															
Capniinae					1										
Taeniopteryginae															
Isogenus															
Isoperla		3	4	1			24		7		2	2		19	1
HEMIPTERA															
Notonecta															
Corixidae															
Trichocorixa															
Corixinae															
HOMOPTERA															
Aphididae			1												
Cicadellidae															
Fulgoridae															
COLEOPTERA															
Gyrinus															
Helichus	1														
Throscinus															
Ilybius															
Eretes															
Agabus	1											1			
Agabinus															
Hydroporus															
Copelatus															
Hygrotus															
Neoelmis															
Optioservus	2														
Ancyronyx															
Heterlimnius													1		
Stenelmis															
Helophorus									1						
Paracymus															
Peltodytes															
Haliplus															
Hyperodes															
Chrysomelidao															

Table B-5-7 (Continued)

Station S-1

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
TRICHOPTERA															
Glossosoma								50							
Rhyacophila															
Brachycentrus							1	1	7					3	1
Micrasema					1		3					1			
Hydropsyche		1					1	3						1	
Macronemum															
Hydroptila							1	1	17			1			
Polycentropus															
Psychomyia															
Molanna		1													
Hesperophylax								3			3				
LEPIDOPTERA															
Pyralididae															
DIPTERA															
Limnophora	1		2		1			1	1		1	1			1
Deuterophlebia															
Dixa															
Atherix	1														
Odontomyia			1											1	
Euparyphus															
Nemotelus															
Psychoda															
Chrysops															
Culex															
Tipulidae		1	2												
Erioptera							1	1		1			1		
Hexatoma											1		1	1	1
c.f. *Pedicia*												1			1
Tipula				1			1	1	1	1	2	1	1	5	1
Simuliidae	5				1		1		1		2	1			
Ceratopogonidae							1						1		1
Chironomidae		2	12	1	10		15	88							
Sp. 1	46								11	3		12	2		14
Sp. 2	5											1			1
Sp. 3									19	24	2		1	1	
Pentaneura										1					
AMPHIPODA															
Gammarus	5		1				2	1				1			
Hyalella	3														
HYDRACARINA								1							
PULMONATA															
Physa								1							
Lymnaea				1							1				
Planorbidae															
PELECYPODA															
Sphaeridae															
HIRUDINEA	4							1							
OLIGOCHAETA	66			4	3			5		2		1	1		3
Tabanidae[1]															
Ephydridae[1]															
Hydrophilinae[2]															
Choroterpes[3]															

Table B-5-7 (Continued)

Station S-2

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
TRICHOPTERA															
Glossosoma															
Rhyacophila															
Brachycentrus															
Micrasema	1														
Hydropsyche		1				1		1						1	
Macronemum															
Hydroptila															
Polycentropus															
Psychomyia			1												
Molanna															
Hesperophylax	1							1	1					1	
LEPIDOPTERA															
Pyralididae							1								
DIPTERA															
Limnophora	1		1	1	1					1		1			2
Deuterophlebia															
Dixa				1											
Atherix	1														
Odontomyia		1								1			1	1	
Euparyphus															
Nemotelus															
Psychoda															
Chrysops															
Culex															
Tipulidae		1		1		2									
Erioptera												1		1	
Hexatoma	2							3	1			3			1
c.f. *Pedicia*												4			1
Tipula	2							1	1		1			7	1
Simuliidae	2	83	9	42	41	14	1		5		3	22			30
Ceratopogonidae				10			1	1			1	15		1	
Chironomidae		38	3	15	11	4	1	18							
Sp. 1	16								1			30		1	20
Sp. 2															
Sp. 3									17	1	1			1	
Pentaneura															
AMPHIPODA															
Gammarus		21	25	9	5	7	1	2	1	1	1	10		4	
Hyalella					9										
HYDRACARINA								1						4	
PULMONATA															
Physa			4	1	1				1			3			1
Lymnaea				5	1					1					
Planorbidae															
PELECYPODA															
Sphaeridae															
HIRUDINEA		5	7	1		7		1	1	4		17	1	1	1
OLIGOCHAETA				47	37		3	153	32	23	3	282	10	11	7
Tabanidae[1]	1														
Ephydridae[1]															
Hydrophilinae[2]		2					1								
Choroterpes[3]															

Table B-5-7 (Continued)

Station S-2

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
COLLEMBOLA															
Isotomurus															
EPHEMEROPTERA															
Callibaetis c.f.				1	9										
Baetis	97	14		2		1	2	13	10		1	1		3	33
Tricorythodes															
Ephemerella	1			1				3	1					13	
Heptagenia															
Rhithrogena															
Stenonema															
ODONATA															
Ophiogomphus															
Gomphus															
Amphiagrion															
Ischnura															
Aeschna															
Leucorrhinia															
PLECOPTERA															
Capniinae															
Taeniopteryginae															
Isogenus															
Isoperla	7							2	5					4	
HEMIPTERA															
Notonecta															
Corixidae															
Trichocorixa															
Corixinae															
HOMOPTERA															
Aphididae															
Cicadellidae															
Fulgoridae															
COLEOPTERA															
Gyrinus															
Helichus	1														
Throscinus															
Ilybius															
Eretes															
Agabus															
Agabinus		1	1						1	1				1	
Hydroporus															
Copelatus															
Hygrotus															
Neoelmis															
Optioservus															
Ancyronyx															
Heterlimnius															
Stenelmis														1	
Helophorus															
Paracymus				1											
Peltodytes															
Haliplus							1		1						
Hyperodes															
Chrysomelidae															

Table B-5-7 (Continued)

Station U.S.L.

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
COLLEMBOLA															
Isotomurus															
EPHEMEROPTERA															
Callibaetis c.f.				10			214		4	36	19			5	
Baetis		48	589												
Tricorythodes															
Ephemerella															
Heptagenia															
Rhithrogena															
Stenonema															
ODONATA															
Ophiogomphus															
Gomphus		2						1							
Amphiagrion										1					
Ischnura		49	2					27	17	3	3			1	
Aeschna										1					
Leucorrhinia															
PLECOPTERA															
Capniinae															
Taeniopteryginae															
Isogenus															
Isoperla															
HEMIPTERA															
Notonecta		1									1				
Corixidae											1			1	
Trichocorixa															
Corixinae			1												
HOMOPTERA															
Aphididae															
Cicadellidae															
Fulgoridae															
COLEOPTERA															
Gyrinus															
Helichus															
Throscinus															
Ilybius										1					
Eretes									1						
Agabus								1							
Agabinus			1	1						1	2			1	
Hydroporus															
Copelatus										2					
Hygrotus										1					
Neoelmis															
Optioservus															
Ancyronyx															
Heterlimnius															
Stenelmis															
Helophorus															
Paracymus															
Peltodytes										1					
Haliplus											1				
Hyperodes															
Chrysomelidae															

Table B-5-7 (Continued)

Station U.S.L.

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
TRICHOPTERA															
Glossosoma															
Rhyacophila															
Brachycentrus															
Micrasema															
Hydropsyche															
Macronemum															
Hydroptila															
Polycentropus															
Psychomyia															
Molanna															
Hesperophylax											1				
LEPIDOPTERA															
Pyralididae															
DIPTERA															
Limnophora									1	1					
Deuterophlebia															
Dixa		6													
Atherix											1				
Odontomyia		1													
Euparyphus															
Nemotelus															
Psychoda															
Chrysops															
Culex										1					
Tipulidae															
Erioptera															
Hexatoma											1				
c.f. *Pedicia*															
Tipula															
Simuliidae															
Ceratopogonidae								1						1	
Chironomidae		22	48					22							
Sp. 1															
Sp. 2															
Sp. 3									30	2	21			3	
Pentaneura										1				1	
AMPHIPODA															
Gammarus			3											1	
Hyalella															
HYDRACARINA								1							
PULMONATA															
Physa			8												
Lymnaea															
Planorbidae															
PELECYPODA															
Sphaeridae															
HIRUDINEA															
OLIGOCHAETA									9	1					
Tabanidae[1]											1				
Ephydridae[1]															
Hydrophilinae[2]		1													
Choroterpes[3]															

Table B-5-7 (Continued)

Station L.S.L.

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
COLLEMBOLA															
Isotomurus															
EPHEMEROPTERA															
Callibaetis c.f.				4	8		42	77	3	8	4	1			
Baetis		3	3										1		
Tricorythodes															
Ephemerella															
Heptagenia															
Rhithrogena															
Stenonema															
ODONATA															
Ophiogomphus															
Gomphus															
Amphiagrion															
Ischnura															
Aeschna															
Leucorrhinia															
PLECOPTERA															
Capniinae															
Taeniopteryginae															
Isogenus															
Isoperla															
HEMIPTERA															
Notonecta															
Corixidae															
Trichocorixa															
Corixinae		1	1												
HOMOPTERA															
Aphididae															
Cicadellidae															
Fulgoridae															
COLEOPTERA															
Gyrinus															
Helichus							1								
Throscinus															
Ilybius															
Eretes															
Agabus															
Agabinus															
Hydroporus															
Copelatus															
Hygrotus															
Neoelmis															
Optioservus								1					7		
Ancyronyx													1		
Heterlimnius												24	8		
Stenelmis															
Helophorus										1					
Paracymus															
Peltodytes															
Haliplus															
Hyperodes															
Chrysomelidae															

Table B-5-7 (Continued)

Station L.S.L.

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
TRICHOPTERA															
Glossosoma															
Rhyacophila															
Brachycentrus															
Micrasema												1			
Hydropsyche		2													
Macronemum															
Hydroptila															
Polycentropus															
Psychomyia															
Molanna															
Hesperophylax															
LEPIDOPTERA															
Pyralididae															
DIPTERA															
Limnophora													1		
Deuterophlebia															
Dixa															
Atherix															
Odontomyia															
Euparyphus															
Nemotelus															
Psychoda															
Chrysops															
Culex															
Tipulidae															
Erioptera															
Hexatoma												1			
c.f. *Pedicia*															
Tipula													1		
Simuliidae															
Ceratopogonidae															
Chironomidae		255	11	30	132		263	154							
Sp. 1										1		2	1		
Sp. 2															
Sp. 3									21	122	87		26		
Pentaneura										1					
AMPHIPODA															
Gammarus		4	1					7			1	25			
Hyalella															
HYDRACARINA															
PULMONATA															
Physa		1							1		1	1			
Lymnaea			1												
Planorbidae															
PELECYPODA															
Sphaeridae								1							
HIRUDINEA								7				3	1		
OLIGOCHAETA		1						10	1			3	1		
Tabanidae[1]															
Ephydridae[1]															
Hydrophilinae[2]		1													
Choroterpes[3]															

Table B-5-7 (Continued)

Station W-1

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
COLLEMBOLA															
Isotomurus															
EPHEMEROPTERA															
Callibaetis c.f.					1										
Baetis	1	3		28	9		21	29	69	13	12	3	15	42	20
Tricorythodes															
Ephemerella				2	1			2			3	1	2	15	
Heptagenia															
Rhithrogena															
Stenonema															
ODONATA															
Ophiogomphus															
Gomphus															
Amphiagrion															
Ischnura															
Aeschna															
Leucorrhinia															
PLECOPTERA															
Capniinae															
Taeniopteryginae															
Isogenus															
Isoperla				4	5		2	13	8	1	3	4	12	1	3
HEMIPTERA															
Notonecta															
Corixidae															
Trichocorixa															
Corixinae															
HOMOPTERA															
Aphididae															
Cicadellidae										1					
Fulgoridae															
COLEOPTERA															
Gyrinus															
Helichus					1										
Throscinus					1										
Ilybius															
Eretes															
Agabus	1														
Agabinus															
Hydroporus															
Copelatus															
Hygrotus															
Neoelmis															
Optioservus	1														1
Ancyronyx															
Heterlimnius				1				1	1	1					
Stenelmis															
Helophorus															
Paracymus															
Peltodytes															
Haliplus		1													
Hyperodes															
Chrysomelidae										1					

Table B-5-7 (Continued)

Station W-1

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
TRICHOPTERA															
Glossosoma															
Rhyacophila															
Brachycentrus															
Micrasema															1
Hydropsyche		1		1	1					1	6	6	4	15	1
Macronemum															
Hydroptila															
Polycentropus															
Psychomyia															
Molanna															
Hesperophylax													1		
LEPIDOPTERA															
Pyralididae															
DIPTERA															
Limnophora	2	11	11	5	4				1	3		1	1		1
Deuterophlebia															
Dixa									1						
Atherix										1	1				
Odontomyia		5	10		1					2	1				
Euparyphus	1							3	1			1	3		2
Nemotelus															
Psychoda															
Chrysops								1							
Culex															
Tipulidae		1	1	1	1										
Erioptera															
Hexatoma															
c.f. *Pedicia*									1			1	1		
Tipula								1	1	1	1	1	5	2	2
Simuliidae	327	29	13	71	1		1			2	1				
Ceratopogonidae															
Chironomidae	66	43	6	22	3		11	105							
Sp. 1												1	5	3	184
Sp. 2										1		1	3		
Sp. 3									4	25	10		21	15	
Pentaneura														1	
AMPHIPODA															
Gammarus															
Hyalella															
HYDRACARINA				1	1				1						1
PULMONATA															
Physa				19									1		5
Lymnaea	1	1	1	3	1			1		1				1	
Planorbidae								1							
PELECYPODA															
Sphaeridae															
HIRUDINEA				1				1					1		
OLIGOCHAETA				5				6	1			1	2		1
Tabanidae[1]															
Ephydridae[1]															
Hydrophilinae[2]															
Choroterpes[3]															

Table B-5-7 (Continued)

Station W-2

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
COLLEMBOLA															
Isotomurus															
EPHEMEROPTERA															
Callibaetis c.f.															
Baetis		8	2	5	2		11	8	8	20	3	8	34	3	1
Tricorythodes															
Ephemerella				1	1									1	
Heptagenia															
Rhithrogena															
Stenonema															
ODONATA															
Ophiogomphus															
Gomphus															
Amphiagrion															
Ischnura															
Aeschna															
Leucorrhinia															
PLECOPTERA															
Capniinae															
Taeniopteryginae															
Isogenus															
Isoperla		1	1	3	1		1	4	7	1	1	1		1	6
HEMIPTERA															
Notonecta															
Corixidae															
Trichocorixa															
Corixinae															
HOMOPTERA															
Aphididae															
Cicadellidae															
Fulgoridae															
COLEOPTERA															
Gyrinus															
Helichus	1														
Throscinus															
Ilybius															
Eretes															
Agabus															
Agabinus	11	1							1						
Hydroporus															
Copelatus															
Hygrotus															
Neoelmis															
Optioservus															
Ancyronyx															
Heterlimnius															
Stenelmis															
Helophorus															
Paracymus															
Peltodytes															
Haliplus															
Hyperodes															
Chrysomelidae															

Table B-5-7 (Continued)

Station W-2

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
TRICHOPTERA															
Glossosoma															
Rhyacophila															
Brachycentrus															1
Micrasema												1			
Hydropsyche		6	1							1				11	
Macronemum				1											
Hydroptila									1						
Polycentropus															
Psychomyia															
Molanna															
Hesperophylax											1				
LEPIDOPTERA															
Pyralididae															
DIPTERA															
Limnophora	1	6	1	1	1			1							
Deuterophlebia															
Dixa															
Atherix															
Odontomyia		4	1												
Euparyphus								1							
Nemotelus															
Psychoda															
Chrysops															
Culex															
Tipulidae		12	7	5	2										
Erioptera															
Hexatoma									1	1					
c.f. *Pedicia*															
Tipula								3	9	1	1			2	2
Simuliidae	8	33	10	1	2							1			
Ceratopogonidae															
Chironomidae		3	5	33	7		1	1							
Sp. 1	280								134		1		1		
Sp. 2	33												1		
Sp. 3										1				8	
Pentaneura															
AMPHIPODA															
Gammarus	3	4	1						1					1	
Hyalella															
HYDRACARINA	1													1	1
PULMONATA															
Physa	1	16		6				1			1	1			5
Lymnaea	1	1		1						2					
Planorbidae									5					1	
PELECYPODA															
Sphaeridae		5						1							
HIRUDINEA				1								1	1		1
OLIGOCHAETA				3	1		1	1			1	1	1		1
Tabanidae[1]				1											
Ephydridae[1]															
Hydrophilinae[2]															
Choroterpes[3]															

Table B-5-7 (Continued)

Station W-3

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
COLLEMBOLA															
Isotomurus															
EPHEMEROPTERA															
Callibaetis c.f.											2				
Baetis	54	39	3	9	2	9	2	15	2	15	2	9	3	2	49
Tricorythodes															
Ephemerella						1		2					1	15	
Heptagenia															
Rhithrogena															
Stenonema															
ODONATA															
Ophiogomphus															
Gomphus															
Amphiagrion															
Ischnura															
Aeschna															
Leucorrhinia															
PLECOPTERA															
Capniinae															
Taeniopteryginae															
Isogenus															
Isoperla				1	1	1		5					1	2	
HEMIPTERA															
Notonecta															
Corixidae															
Trichocorixa															
Corixinae															
HOMOPTERA															
Aphididae		1													
Cicadellidae										1					
Fulgoridae															
COLEOPTERA															
Gyrinus															
Helichus															
Throscinus															
Ilybius															
Eretes															
Agabus	1														
Agabinus															1
Hydroporus															
Copelatus															
Hygrotus															
Neoelmis															
Optioservus															
Ancyronyx															
Heterlimnius															
Stenelmis															
Helophorus															
Paracymus															
Peltodytes															
Haliplus															
Hyperodes															
Chrysomelidae															

Table B-5-7 (Continued)

Station W-3

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
TRICHOPTERA															
Glossosoma															
Rhyacophila															
Brachycentrus												1	1		
Micrasema				1											
Hydropsyche		1				1								1	
Macronemum															
Hydroptila															
Polycentropus															
Psychomyia															
Molanna															
Hesperophylax									1						
LEPIDOPTERA															
Pyralididae															
DIPTERA															
Limnophora	1	1	2	2	1	1			1	2	1	1			3
Deuterophlebia															
Dixa										1					
Atherix	1						1	1							
Odontomyia															
Euparyphus								1				1			1
Nemotelus								1							
Psychoda													1		
Chrysops															
Culex															
Tipulidae		1	5	14	1	1									
Erioptera										1					
Hexatoma	1						1	1	1	1					
c.f. *Pedicia*															
Tipula								5	1	1				1	
Simuliidae		1		3	9	3				1	1	1			
Ceratopogonidae	1			1											1
Chironomidae		1	11	11	1	2	1	115							
Sp. 1	133								64			1			97
Sp. 2	21														8
Sp. 3										2	1		1	2	
Pentaneura															
AMPHIPODA															
Gammarus		1						1	1			1	1	1	1
Hyalella															
HYDRACARINA								1							1
PULMONATA															
Physa												1			3
Lymnaea													1	1	
Planorbidae															
PELECYPODA															1
Sphaeridae															
HIRUDINEA		1		1		1		1			1				
OLIGOCHAETA	10	3	28	13	2	10	4	6	39	6	4	1	1		1
Tabanidae[1]				1											
Ephydridae[1]															1
Hydrophilinae[2]		1	1	1											
Choroterpes[3]															

Table B-5-7 (Continued)

Station U.W.L.

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
COLLEMBOLA															
Isotomurus															
EPHEMEROPTERA															
Callibaetis c.f.					5		2	3	1	111	12	2		28	271
Baetis		73	27							2		1			6
Tricorythodes															
Ephemerella				45				1							
Heptagenia															
Rhithrogena													36		
Stenonema															
ODONATA															
Ophiogomphus															
Gomphus			1												
Amphiagrion													1		
Ischnura		6	8				1			19		2			
Aeschna															
Leucorrhinia										1					
PLECOPTERA															
Capniinae															
Taeniopteryginae															
Isogenus															
Isoperla							1								
HEMIPTERA															
Notonecta		1													
Corixidae															
Trichocorixa										1					
Corixinae		1	2												
HOMOPTERA															
Aphididae															
Cicadellidae															
Fulgoridae															
COLEOPTERA															
Gyrinus															
Helichus															
Throscinus															
Ilybius															
Eretes															
Agabus												2			
Agabinus		1	1						1					1	1
Hydroporus															
Copelatus															
Hygrotus															
Neoelmis															
Optioservus															
Ancyronyx															
Heterlimnius											1				
Stenelmis															
Helophorus															
Paracymus															
Peltodytes															
Haliplus									1				1		19
Hyperodes															
Chrysomelidae															

Table B-5-7 (Continued)

Station U.W.L.

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
TRICHOPTERA															
Glossosoma															
Rhyacophila															
Brachycentrus															
Micrasema															
Hydropsyche								2							
Macronemum															
Hydroptila															
Polycentropus															
Psychomyia															
Molanna															
Hesperophylax															
LEPIDOPTERA															
Pyralididae															
DIPTERA															
Limnophora												2			
Deuterophlebia															
Dixa															
Atherix															
Odontomyia															
Euparyphus															
Nemotelus															
Psychoda															
Chrysops															
Culex															
Tipulidae															
Erioptera															
Hexatoma															
c.f. *Pedicia*												1			
Tipula								1			2	1			
Simuliidae												1			1
Ceratopogonidae												20			
Chironomidae		165	2	19	9		50	13							
Sp. 1										4		702	18		2294
Sp. 2													6		
Sp. 3									44	100	98		1	5	
Pentaneura															
AMPHIPODA															
Gammarus		4			2		2	1	1	3	2	113	2	1	3
Hyalella															
HYDRACARINA															
PULMONATA															
Physa							1	1					1		40
Lymnaea		7		1	1		1		1	4	1		1	2	
Planorbidae															
PELECYPODA															
Sphaeridae															
HIRUDINEA											2	8			1
OLIGOCHAETA								1	13		1	113			1
Tabanidae[1]															
Ephydridae[1]															2
Hydrophilinae[2]															
Choroterpes[3]															

Table B-5-7 (Continued)

Station L.W.L.

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
COLLEMBOLA															
Isotomurus															
EPHEMEROPTERA															
Callibaetis c.f.					5		52	37		2	8	201		12	45
Baetis															
Tricorythodes															
Ephemerella				7					11					4	
Heptagenia															
Rhithrogena													26		
Stenonema															
ODONATA															
Ophiogomphus															
Gomphus															
Amphiagrion															
Ischnura															
Aeschna															
Leucorrhinia															
PLECOPTERA															
Capniinae															
Taeniopteryginae															
Isogenus															
Isoperla															
HEMIPTERA															
Notonecta					1										
Corixidae															
Trichocorixa															
Corixinae							1								
HOMOPTERA															
Aphididae															
Cicadellidae															
Fulgoridae															
COLEOPTERA															
Gyrinus															
Helichus															
Throscinus															
Ilybius															
Eretes															
Agabus								2				4			
Agabinus				1	5		1		1						7
Hydroporus															
Copelatus															
Hygrotus															
Neoelmis															
Optioservus															
Ancyronyx															
Heterlimnius															
Stenelmis															
Helophorus															
Paracymus															
Peltodytes															
Haliplus											2		1		
Hyperodes															
Chrysomelidae															

Table B-5-7 (Continued)

Station L.W.L.

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
TRICHOPTERA															
Glossosoma															
Rhyacophila															
Brachycentrus															
Micrasema															
Hydropsyche							1								
Macronemum								1							
Hydroptila															
Polycentropus															
Psychomyia															
Molanna															
Hesperophylax															
LEPIDOPTERA															
Pyralididae															
DIPTERA															
Limnophora															
Deuterophlebia															
Dixa															
Atherix															
Odontomyia															
Euparyphus															
Nemotelus															
Psychoda															
Chrysops															
Culex															
Tipulidae															
Erioptera															
Hexatoma															
c.f. *Pedicia*															
Tipula															
Simuliidae															
Ceratopogonidae														1	1
Chironomidae				69	6		2	17							
Sp. 1												11	1		41
Sp. 2															
Sp. 3									60	61	8			1	
Pentaneura														1	
AMPHIPODA															
Gammarus				1	10				1		4	3		1	1
Hyalella							1			1					
HYDRACARINA															
PULMONATA															
Physa														1	
Lymnaea														1	
Planorbidae															
PELECYPODA															
Sphaeridae															
HIRUDINEA										1			1		1
OLIGOCHAETA								5			5	1	4		3
Tabanidae[1]															
Ephydridae[1]															
Hydrophilinae[2]															
Choroterpes[3]															

Table B-5-7 (Continued)

Station W.R.-1

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
COLLEMBOLA															
Isotomurus															
EPHEMEROPTERA	148														
Callibaetis c.f.															1
Baetis	1	31	2	64	22		33			21			10		22
Tricorythodes	10			45	1					10					38
Ephemerella				118	20		87		3				29		12
Heptagenia	7			2	1										3
Rhithrogena				9	7		1			2			14		2
Stenonema									2						
ODONATA	1														
Ophiogomphus				1											
Gomphus															
Amphiagrion															
Ischnura															
Aeschna															
Leucorrhinia															
PLECOPTERA															
Capniinae															
Taeniopteryginae				11	7										
Isogenus															
Isoperla			10	15	5		27			1			14		1
HEMIPTERA															
Notonecta															
Corixidae			1												
Trichocorixa															
Corixinae			1												
HOMOPTERA															
Aphididae															
Cicadellidae															
Fulgoridae															
COLEOPTERA	1														
Gyrinus															
Helichus															
Throscinus										1					
Ilybius															
Eretes															
Agabus															
Agabinus									1						
Hydroporus					1										
Copelatus															
Hygrotus															
Neoelmis															
Optioservus															1
Ancyronyx										1					
Heterlimnius				1	1					1					
Stenelmis															
Helophorus															
Paracymus															
Peltodytes															
Haliplus															
Hyperodes															
Chrysomelidae															

Table B-5-7 (Continued)

Station W.R.-1

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
TRICHOPTERA															
Glossosoma															
Rhyacophila															
Brachycentrus	1			1						2					
Micrasema							1								2
Hydropsyche	15	27		4	11		4		1	98			1		1
Macronemum				2											
Hydroptila				15	1										5
Polycentropus							1								
Psychomyia				1											
Molanna															
Hesperophylax															
LEPIDOPTERA															
Pyralididae															
DIPTERA	11														
Limnophora					1										
Deuterophlebia				1											
Dixa															
Atherix										2					
Odontomyia															
Euparyphus															
Nemotelus															
Psychoda															
Chrysops															
Culex															
Tipulidae		1													
Erioptera															
Hexatoma							1			3					
c.f. *Pedicia*															
Tipula	1														1
Simuliidae		1	1	1	1		1			1			1		2
Ceratopogonidae															
Chironomidae		11	6	15	10		6								
Sp. 1	6												3		25
Sp. 2										2					
Sp. 3										12			3		
Pentaneura															
AMPHIPODA															
Gammarus															
Hyalella															
HYDRACARINA	1								1						1
PULMONATA															
Physa															
Lymnaea															
Planorbidae															
PELECYPODA															
Sphaeridae															
HIRUDINEA															
OLIGOCHAETA									1						
Tabanidae[1]															
Ephydridae[1]															
Hydrophilinae[2]															
Choroterpes[3]										8					

Table B-5-7 (Continued)

Station W.R.-2

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
COLLEMBOLA															
Isotomurus															
EPHEMEROPTERA															
Callibaetis c.f.															7
Baetis	180	88	5	85	11		21	6	1	9	1		38		10
Tricorythodes	138			52	1			1		2	2				37
Ephemerella	18			40	4		13	19	27		24		39		2
Heptagenia	1			1											1
Rhithrogena	8			3			2						9		
Stenonema				1											
ODONATA															
Ophiogomphus	1														
Gomphus				1											
Amphiagrion															
Ischnura															
Aeschna															
Leucorrhinia															
PLECOPTERA															
Capniinae															
Taeniopteryginae				40	1										
Isogenus		1													
Isoperla	1	1	3	15	1		16	3	2		7		20		
HEMIPTERA															
Notonecta															
Corixidae			1												
Trichocorixa															
Corixinae															
HOMOPTERA															
Aphididae															
Cicadellidae															
Fulgoridae															
COLEOPTERA															
Gyrinus															
Helichus															
Throscinus															
Ilybius															
Eretes															
Agabus															
Agabinus															
Hydroporus															
Copelatus															
Hygrotus															
Neoelmis															
Optioservus															
Ancyronyx															
Heterlimnius	1														
Stenelmis															
Helophorus															
Paracymus															
Peltodytes															
Haliplus															
Hyperodes															
Chrysomelidae															

Table B-5-7 (Concluded)

Station W.R.-2

TAXA	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
TRICHOPTERA															
Glossosoma															
Rhyacophila								1							
Brachycentrus	1	1													
Micrasema															
Hydropsyche	163	43	5	1	1		1	1	1	47	21		4		4
Macronemum				1											
Hydroptila	2			6	1										1
Polycentropus															
Psychomyia															
Molanna															
Hesperophylax															
LEPIDOPTERA															
Pyralididae															
DIPTERA															
Limnophora		1													
Deuterophlebia															
Dixa															
Atherix	3						1			1					
Odontomyia															
Euparyphus															
Nemotelus															
Psychoda															
Chrysops															
Culex															
Tipulidae		7	1	1											
Erioptera															
Hexatoma	1									1					1
c.f. *Pedicia*															
Tipula															
Simuliidae	87	14		3				1		1	1		1		
Ceratopogonidae				2	1										
Chironomidae		4	17	165	13		10	2							
Sp. 1	31												2		5
Sp. 2	9												1		
Sp. 3										12	6				
Pentaneura															
AMPHIPODA															
Gammarus															
Hyalella															
HYDRACARINA															1
PULMONATA															
Physa															
Lymnaea															
Planorbidae															
PELECYPODA															
Sphaeridae															
HIRUDINEA				1											
OLIGOCHAETA				43			1								
Tabanidae[1]		1													
Ephydridae[1]															
Hydrophilinae[2]															
Choroterpes[3]										1					

1. Diptera
2. Coleoptera
3. Ephemeroptera

Table B-5-8 FISH COLLECTED FROM PICEANCE, STEWART AND WILLOW CREEKS AND THE WHITE RIVER, AUGUST 1974-JULY 1976

Scientific Name[1]	Common Name[1]
Salmo trutta	Brown trout
Salmo gairdneri	Rainbow trout
Salvelinus fontinalis	Brook trout
Prosopium williamsoni	Mountain whitefish
Rhinichthys osculus	Speckled dace
Catostomus latipinnus	Flannelmouth sucker
Catostomus platyrhynchus	Mountain sucker
Cottus bairdi	Mottled sculpin

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[1] American Fisheries Society. 1970. A List of Common and Scientific Names of Fishes from the United States and Canada. 3rd Ed. Spec. Pub. No. 6.

Table B-5-9 SPECIES AND NUMBERS OF FISH CAPTURED AT PICEANCE BASIN STATIONS AUGUST 1974 - JULY 1976

	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
Station P-1															
Salmo trutta				1											
Salvelinus fontinalis				1			2		2	3	1		1	2	
Rhinichthys osculus		30		4			3		35	8			2	1	2
Catostomus platyrhynchus		104		44			20	1	42	55	9	1	18	8	14
Station P-2															
Salmo gairdneri													1	2	
Salvelinus fontinalis						1	1	1	1	7	3	1	1	3	4
Rhinichthys osculus							1			1		1	1	5	
Catostomus platyrhynchus		24		14		71	5		2	3	2	65	8	5	4
Station P-3															
Salmo gairdneri							1								
Salvelinus fontinalis							2	1	7	3	3	1	3	5	
Rhinichthys osculus				2			12		14	11		1	1	14	
Catostomus platyrhyncus		2		48			2		24	22	5	2	6	38	
Station P-4*															
Rhinichthys osculus				2											
Catostomus platyrhyncus		1													
Station P-5															
Salmo gairdneri														1	
Rhinichthys osculus							1			1	1		2	5	
Catostomus platyrhynchus		3		7			3	1	4	9	1		2	7	
Station P-5A															
Salmo trutta													1		
Salmo gairdneri									1				1	1	
Salvelinus fontinalis							2	1		3	1		5	2	1
Rhinichthus osculus								4		1	1		1	5	
Catostomus platyrhynchus							5	2	1	4	1		4	10	4
Station P-6															
Salvelinus fontinalis													2		
Rhinichthys osculus		6						1						4	
Catostomus platyrhynchus		18						1	2	14			3	5	
Station P-7															
Rhinichthys osculus		8							3					3	10
Catostomus latipinnus							1								
Catostomus platyrhynchus		2													

* only sampled twice

Table B-5-9 (Concluded)

	1974					1975						1976			
	AUG	SEP	OCT	NOV	DEC	JAN	MAR	MAY	JUL	SEP	NOV	JAN	MAR	MAY	JUL
Station S-1															
Salvelinus fontinalis									2	2	1		5	4	2
Station S-2															
Salvelinus fontinalis						36	7	6	6	2	4	15	14	16	4
Rhinichthys osculus						15				12	4	5			
Catostomus platyrhynchus						11						7			
USL															
No fish															
LSL															
Salmo gairdneri						1									
Salvelinus fontinalis		36		15		42	74	9	7	3		12	11	21	
Rhinichthys osculus						2	1								
W 1															
No fish															
W-2															
Catostomus platyrhynchus											18			7	
W-3															
Salvelinus fontinalis		1		2				2			2				
Rhinichthys osculus		1													
Catostomus platyrhynchus		1		1		6	1				2				
WR-1															
Prosopium williamsoni							3							1	
Rhinichthys osculus				1										1	
Catostomus latipinnus				1			5						1	2	
Catostomus sp.															1
Cottus bairdi				1			1			1				1	1
WR-2															
Proposium williamsoni							1						7	2	
Rhinichthys osculus										50			1	1	
Cottus bairdi										18			2		

Table B-5-10 LENGTH-FREQUENCY DISTRIBUTION OF MOUNTAIN SUCKERS OVER TWELVE SAMPLING PERIODS FROM PICEANCE BASIN

Class Interval	1974		1975						1976			
(mm)	September	November	January	March	May	July	September	November	January	March	May	July
10-19						19	1					
20-							10					
30-							4					
40-						1	1			1	1	
50-							1				2	
60-						8				1	1	1
70-	4					7	3	1		3	5	2
80-	7	4	2		2	8	10	1		4	12	2
90-	9	4	1	2		4	11	6	2	4	15	1
100-	2		3	1		10	15	3	3	4	3	2
110-	4	5	1	3		14	9	3		2	12	8
120-	13	18	15	10	1	11	9	6	5	2	5	4
130-	26	23	12	9	2	11	14	3	6	5	3	4
140-	22	21	20	5		22	15	6	9	3	10	2
150-	7	16	5	2		9	19	3	14	7	5	1
160-	4	11	9			2	11	4	14	2	3	1
170-	7	4	6	1		1	7		10	1	1	1
180-	5	5	6			1	3		5		1	
190-	3		1	1			1	2	4	1		
200-	2	3	5	1		1			1			
210-219	1		2							1		

Species legend: Mountain Sucker = *Catostomus platyrhynchus*

Table B-5-11 FECUNDITY ESTIMATES FOR FEMALE MOUNTAIN SUCKERS

No.	Size (mm)	Weight (gm)	Total Weight Ovary	Subsample #1			Subsample #2			Subsample #3			Estimated Aver. No. of Eggs
				Weight	No. of Eggs	Fecundity Estimate	Weight	No. of Eggs	Fecundity Estimate	Weight	No. of Eggs	Fecundity Estimate	
1	134	26.0	2.6874	.0739	113	4109	.1530	239	4197	.1796	258	3860	4055
2	132	26.0	2.4397	.0961	107	2716	.1165	159	3329	.1126	165	3578	3206
3	129	27.5	2.6677	.0704	110	4168	.0959	160	4450	.1120	163	3882	4166
4	134	26.0	2.2917	.1043	100	2197	.0621	87	3210	.1187	135	2606	2671
5	190	78.2	6.3719	.1906	200	6686	.1779	247	8845	.1465	243	10568	8699
6	162	51.4	4.0201	.2864	473	6636	.0999	473	6800	.1039	242	9362	7599
7	161	47.5	3.1460	.0630	175	8739	.0713	194	8560	.0448	136	9550	8949
8	157	52.0	3.1075	.0432	84	6042	.0595	135	7051	.0987	213	6706	6600
9	140	35.5	3.3219	.0573	182	10551	.0400	203	16858	.0690	208	10014	12474
10	128	25.0	.3616	.0073	134	6638	.0163	136	3017	.0316	284	3250	4302
11	145	40.5	2.1462	.0579	157	5820	.0495	168	7284	.0580	217	8030	7045
12	150	38.5	2.5428	.0957	206	5474	.0934	232	6316	.0903	205	5773	5854
13	156	62.0	8.3400	.1817	212	9730	.0800	106	11051	.0895	110	10250	10344
14	146	78.5	12.2440	.1573	175	13622	.0914	104	13932	.0984	116	14434	13996
15	154	46.0	5.3855	.0930	133	7702	.0818	134	8822	.0832	108	6991	7838
16	141	39.0	3.1538	.0767	170	6990	.0924	181	6178	.0811	155	6028	6399
17	161	50.0	5.2100	.1135	206	9456	.0740	112	7885	.0981	155	8232	8524
18	165	46.0	1.2363	.0306	126	5090	.0252	103	5057	.0405	136	4148	4765
19	145	31.0	1.0488	.0166	100	6320	.0155	86	5822	.0272	123	4748	5630
20	117	18.0	0.1628	.0053	79	2425	.0066	106	2618	.0117	185	2571	2538
21	135	28.0	1.3261	.0207	142	9102	.0208	130	8281	.0116	62	7086	8156
22	135	25.0	0.2412	.0104	97	2250	.0062	73	2847	.0110	123	2694	2597

Table B-5-12

COMPUTED CONDITION FACTOR (CF)[1] FOR MOUNTAIN SUCKERS COLLECTED IN PICEANCE BASIN STREAMS

	Month											
	September 1974	November 1974	January 1975	March 1975	May 1975	July 1975	September 1975	November 1975	January 1976	March 1976	May 1976	July 1976
100-140 mm Size Range												
Number of Fish	10	10	10	10	3	10	10	10	10	10	10	10
Condition Factor												
Range*	0.77-1.30	0.68-1.12	0.78-1.06	1.08-1.51	0.86-1.17	0.90-1.35	0.67-1.37	0.76-1.69	0.86-1.05	0.80-1.64	0.49-1.35	0.67-1.58
Average*	1.01	0.94	0.88	1.22	1.02	1.09	0.98	1.15	0.96	1.22	0.92	1.04
140-180 mm Size Range												
Number of Fish	10	10	10	8	---	10	10	10	10	10	10	5
Condition Factor												
Range*	0.77-1.25	0.87-1.25	0.83-1.08	0.74-1.19	---	0.66-1.04	0.68-1.13	0.93-1.65	0.81-1.34	0.80-1.33	0.87-1.26	0.85-1.19
Average*	1.02	0.99	1.00	0.99	---	0.93	0.94	1.09	1.09	1.07	1.07	0.99
180-220 mm Size Range												
Number of Fish	10	5	10	2	---	4	3	2	9	2	2	
Condition Factor												
Range*	0.98-1.24	0.96-1.15	0.91-1.10	0.99-1.13	---	0.88-1.18	0.94-1.07	0.96-1.18	0.94-1.36	0.91-1.02	0.97-1.14	---
Average*	1.08	1.08	0.99	1.06	---	1.04	1.02	1.07	1.06	0.97	1.06	---

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[1] Ricker (1968)

* x 10^{-5}

Table B-5-13 STOMACH CONTENTS[1] OF 10 MOUNTAIN SUCKERS COLLECTED IN PICEANCE BASIN, COLORADO

	Fish #									
Stomach Contents	1	2	3	4	5	6	7	8	9	10
Ephemeroptera										
Baetidae				4						
Baetis	3									
Diptera										
Simuliidae	7	12	2	9		2	3		2	
Chironomidae	19	21	3	17	30	1	19	1	12	3
All insects	60%	50%	5%	75%	30%	5%	40%	99%	15%	1%
Algal material	40%	50%	95%	25%	70%	95%	60%	1%	85%	99%
Volume of Contents (ml)	0.1	0.2	0.1	0.1	0.1	0.1	0.2	<0.1	0.1	<0.1

[1] Number of individuals

Table B-5-14 FECUNDITY ESTIMATES FOR FEMALE SPECKLED DACE

No.	Size (mm)	Weight (gm)	Total Weight Ovary	Subsample #1 Weight	Subsample #1 No. of Eggs	Subsample #1 Fecundity Estimate	Subsample #2 Weight	Subsample #2 No. of Eggs	Subsample #2 Fecundity Estimate	Subsample #3 Weight	Subsample #3 No. of Eggs	Subsample #3 Fecundity Estimate	Estimated Aver. No. of Eggs
1	94	9	1.7796	.0548	165	5358	.2028	423	3711	.0723	176	4332	4467
2	87	7	0.9550	.0497	120	2305	.0551	180	3119	.0742	207	2664	2696
3	109	145	1.5166	.0717	291	6155	.0744	361	7358	.1117	551	7481	6998
4	111	16	1.8365	.0682	142	3824	.0985	268	4997	.0616	139	4144	4322
5	119	22	1.9842	.0800	179	4440	.0754	128	3368	.0566	111	3891	3900
6	90	9	1.4730	.0334	65	2866	.0578	130	3315	.0383	92	3533	3238

#1-3 collected in July 1975
#4-5 collected in May 1976
#6 collected in July 1976

Table B-5-15

LENGTH-FREQUENCY DISTRIBUTION OF BROOK TROUT OVER TWELVE SAMPLING PERIODS FROM PICEANCE BASIN

Class Interval (mm)	September	November	January	March	May	July	September	November	January	March	May	July
40-49					4						5	
50-					3						4	
60-						1	1					
70-	6	1				1						1
80	3		2			4						
90-	6		1	1		1	1		4	2		
100-	7		3	1	1		1		6	4	2	1
110-	6	4	1	9	1		1	1	3	4	9	2
120-	3	4	15	10	1			2	5		2	
130-	3	4	12	17	2	1	1		1	5	4	
140-	1	3	20	24	2	3			2	3	1	
150-			5	15	2		1	1	2	1	3	
160-			9	6		2	1	1	1		2	
170-			6	1		2		1			1	
180-			6		1	2	1				2	2
190-			1		1	4	2	2	1			2
200-			5	2	2	1	2		1		1	2
210-			2			1	3	1	1	2		
220-							2					
230-							1			5		
240-										1	3	
250-	1			1			1			2	5	
260-	1								2	4	2	
270-										3	3	1
280-								2		1	1	
290-							1			1	1	
300-										1		
310-												
320-										1		
330-											1	
340-							1	1		1		
350-												
360-										1		
370-												
380-												
390-							1	1			1	
400-								1				
460-							1					

Species legend: Brook Trout = *Salvelinus fontinalis*

Table B-5-16 FECUNDITY ESTIMATES FOR FEMALE BROOK TROUT

No.	Size (mm)	Weight (gm)	Total Weight Ovary	Subsample #1			Subsample #2			Subsample #3			Estimated Aver. No. of Eggs
				Weight	No. of Eggs	Fecundity Estimate	Weight	No. of Eggs	Fecundity Estimate	Weight	No. of Eggs	Fecundity Estimate	
1	225	215	5.5717	.2366	43	1013	.3969	71	997	.3669	61	926	978
2	297	387	4.9203	.5264	103	962	.4696	92	963	.3739	83	1091	1006
3	227	103	0.9876	.0520	124	2355	.0524	96	1809	.0438	102	2300	2155

Table B-5-17 STOMACH CONTENTS[1] OF 14 BROOK TROUT COLLECTED IN PICEANCE BASIN

Stomach Contents	Fish # 1	2	3	4	5	6	7	8	9	10	11	12	13	14
ANNELIDA														
Oligochaeta			3 (2)											
Hydracarina										1	1			
ARTHROPODA														
Crustacea														
Amphipoda														
Gammaridae														
Gammarus		27 (14)							2					
Insecta														
Plecoptera														
Isoperla						1			21					
Ephemeroptera													2	
Baetidae					5					2	4			
Baetis	2 (3)	12 (6)	9 (8)											
Ephemerella									2					
Adults			4 (3)											
Odonata														
Adults		1 (0.5)												
Orthoptera														
Hemiptera														
Coreidae[2]		1 (0.5)												
Tricoptera											3			
Hydropsychidae														
Hydropsyche			1 (1)							1				
Limnephilidae														
Hesperophylax									2					
Brachycentridae														
Brachycentrus									1					

Table B-5-17 (Continued)

Stomach Contents[1]	Fish # 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Coleoptera											2		2	
Hydraenidae	1 (1.5)													
Dytiscidae														
Agabinus		3 (1.5)										1	1	79
Diptera														
Tipulidae	1 (1.5)	1 (0.5)	2 (2)						1				2	
Tipula					1					5	1	2		6
Hexatoma														58
Simuliidae		35 (18)	15 (14)											
Culicidae		4 (2)	24 (22)					≈250						
Stratiomyiidae										1				
Odontomyia		3 (1.5)	3 (2)	1	1									
Anthomyiidae														
Limnophora				21							2	1	3	
Chironomidae	54 (90)	106 (54)	48 (44)	3	3	4	8	17		2	4		3	1
Ceratopogonidae										1				
Adults		3 (1.5)												
Homoptera														
Cicadellidae[2]	2 (3)	1 (0.5)	1 (1)						1					
Algae	(5)													
Total Organisms	60	197	110	25	10	5	8	267	30	13	17	4	13	144
Total Stomach Volume	0.2 ml	1.4 ml	1.8 ml	2.0 ml	3.0 ml	<1.0 ml		.5 ml	2.5 ml					

[1] Number of individuals; percentage of contents in parentheses
[2] Terrestrial

Table B-5-18 GROWTH OF TAGGED BROOK TROUT WHICH WERE RECAPTURED AT A LATER DATE

Tag No.	Date Tagged	Length (mm)	Weight (gm)	Date Recaptured	Length (mm)	Weight (gm)	Growth Length (mm)	Growth Weight (gm)	Time (months)
F-001	5-17-75	119	18	7-12-75	145	34	26	16	2 (May - July)
F-008	5-17-75	150	32	7-13-75	170	50	20	18	2 (May - July)
				9-9-75	197	90	27	40	2 (July - September)
							47	58	4 (May - September)
F-017	7-12-75	179	80	9-8-75	207	128	28	48	2 (July - September)
F-031	7-13-75	69	3	5-4-76	130	20	61	17	10 (July - May)
F-033	7-13-75	94	12	1-21-76	147	28	53	16	6 (July - January)
F-055	11-13-75	345	410	3-11-76	334	365	-11	-45	4 (November - March)
F-062	11-13-75	129	20	3-8-76	137	30	8	10	4 (November - March)
				7-27-76	182	80	45	50	4 (March - July)
							53	60	8 (November - July)
F-064	11-13-75	194	80	1-21-76	190	60	-4	-20	2 (November - January)
F-095	1-21-76	124	20	5-4-76	142	26	18	6	5 (January - May)
F-097	1-21-76	105	6	3-11-76	112	10	7	4	2 (January - March)
F-098	1-21-76	103	10	3-11-76	107	12	4	2	2 (January - March)
F-099	1-21-76	94	8	5-4-76	110	5	16	-3	4 (January - May)
F-106	1-21-76	100	14	3-11-76	112	10	12	-4	2 (January - March)

Table B-5-18 (continued)

Tag No.	Date Tagged	Length (mm)	Weight (gm)	Date Recaptured	Length (mm)	Weight (gm)	Growth Length (mm)	Growth Weight (gm)	Time (months)
F-109	1-21-76	97	8	5-4-76	124	12	27	4	4 (January - May)
F-123	3-7-76	245	126	5-5-76	249	-	4	-	2 (March - May)
F-127	3-8-76	277	210	5-3-76	275	202	-2	-8	2 (March - May)
				7-27-76	272	240	-3	38	2 (May - July)
							-5	30	4 (March - July)
F-129	3-8-76	260	170	5-3-76	290	240	30	70	2 (March - May)
F-135	3-8-76	155	30	5-4-76	169	46	14	16	2 (March - May)

Table B-5-19

COMPUTED CONDITION FACTOR (CF)[1] FOR BROOK TROUT COLLECTED IN PICEANCE BASIN STREAMS

	Month											
	September 1974	November 1974	January 1975	March 1975	May 1975	July 1975	September 1975	November 1975	January 1976	March 1976	May 1976	July 1976
100-140 mm Size Range												
Number of Fish	10	10	10	10	5	1	3	4	10	10	10	3
Condition Factor												
Range*	0.94-1.46	0.56-1.35	0.65-1.13	0.77-2.07	0.97-1.44	---	0.84-1.32	0.89-1.15	0.52-1.26	0.71-1.30	0.37-1.44	0.91-1.46
Average*	1.20	0.88	0.82	1.15	1.13	1.24	1.04	0.97	0.92	0.94	0.91	1.19
140-180 mm Size Range												
Number of Fish	3	3	10	11	5	7	2	3	4	4	7	---
Condition Factor												
Range*	---	0.64-1.00	0.70-1.05	0.67-1.17	0.51-1.10	0.77-1.39	1.05-10.7	0.81-1.71	0.79-1.14	0.80-0.87	0.90-1.03	---
Average*	---	0.80	0.85	0.98	0.82	1.02	1.06	1.21	0.92	0.85	0.95	---
180-220 mm Size Range												
Number of Fish	---	---	1	2	3	5	9	3	3	2	3	6
Condition Factor												
Range*	---	---	---	0.83-0.85	1.10-1.26	1.12-1.58	1.10-1.44	1.10-1.71	0.87-1.08	1.03-1.07	0.72-0.87	1.18-1.74
Average*	---	---	0.82	0.84	1.15	1.33	1.28	1.32	0.99	1.05	0.80	1.46

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[1] Ricker (1968)

* x 10^{-5}

Table B-5-20 NUMBERS OF FISH CAPTURED, MARKED[1] AND RECAPTURED AT PICEANCE BASIN[2] STATIONS FROM SEPTEMBER 1974 THROUGH JANUARY 1976

Month and Station	Brook Trout			Rainbow Trout			Brown Trout			Mountain Sucker			Flannelmouth Sucker			Speckled Dace			Totals		
	C*	M*	R*	C*	M*	R*	C*	M*	R*	C*	M*	R*	C*	M*	R*	C*	M*	R*	C*	M*	R*
September 1974																					
P-1										103	59	-				28	27	-	131	86	-
P-2										24	19	-							24	19	-
P-3										4	4	-							4	4	-
P-4										1	--	-							1	-	-
P-5				1	1	-				3	3	-							4	4	-
P-6										18	16	-				6	5	-	24	21	-
P-7										2	2	-				8	8	-	10	10	-
W-3	1	1	-							1	1	-				1	1	-	3	3	-
L.S.L.	78	54	-							-	-	-				-	-	-	78	54	-
Totals	79	55	-	1	1	-				156	104	-				43	41	-	279	201	-
November 1974																					
P-1	1	1	-				1	1	-	44	42	2				4	4	-	50	48	2
P-2										14	13	1							14	13	1
P-3										48	48	-				2	-	-	50	43	-
P-4																2	-	-	2	-	-
P-5										7	7	-							7	7	-
W-3	2	2	-							1	1	-							3	3	-
L.S.L.	15	14	1																15	14	1
WR-2													1	1	-	1	-	-	2	1	-
Totals	18	17	1	-	-	-	1	1	-	114	111	3	1	1	-	9	4	-	143	134	4
January 1975																					
P-2	1	-	-							72	-	-							73	-	-
S-2	36	-	-							11	-	-				15	-	-	62	-	-
L.S.L.	42	-	-	1	-	-										2	-	-	45	-	-
W-3										6	-	-							6	-	-
Totals	79	-	-	1	-	-	-	-	-	89	-	-	-	-	-	17	-	-	186	-	-

Table B-5-20 (Continued)

Month and Station	Brook Trout			Rainbow Trout			Brown Trout			Mountain Sucker			Flannelmouth Sucker			Speckled Dace			Totals		
	C*	M*	R*	C*	M*	R*	C*	M*	R*	C*	M*	R*	C*	M*	R*	C*	M*	R*	C*	M*	R*
March 1975																					
P-1	2	-	-							20	-	-				3	-	-	25	-	-
P-2	1	-	-							5	-	-				1	-	-	7	-	-
P-3	2	1	-	1	1	-				2	1	-				12	-	-	17	3	0
P-5										3	-	-				1	-	-	4	-	-
P-5A	2	2	-							5	5	-							7	7	-
P-7													1	1	-				1	1	-
S-2	7	-	-																7	-	-
LSL	74	-	3																74	-	3
W-3										1	-	-							1	-	-
WR-1													5	5	-				5	5	-
	88	3	3	1	1	-	-	-	-	36	6	-	6	6	-	17	-	-	148	16	3
May 1975																					
P-1										1	-	-							1	-	-
P-2	1	-	-							1	-	-							2	-	-
P-3	1	1	-																1	1	-
P-5										1	-	-							1	-	-
P-5A	1	1	-							2	1	-				4	-	-	7	2	-
P-6										1	-	-				1	-	-	2	-	-
S-2	6	6	-																6	6	-
LSL	8	2	-																8	2	-
W-3	2	2	-																2	2	-
	19	12	0	-	-	-	-	-	-	6	1	-	-	-	-	5	-	-	30	13	-
July 1975																					
P-1	2	2	-	-	-	-				42	-	1				35	-	-	79	2	1
P-2	1	1	-	-	-	-				2	2	-				-	-	-	3	3	-
P-3	7	6	1	-	-	-				24	6	-				14	-	-	45	12	1
P-5	-	-	-	-	-	-				4	-	-				-	-	-	4	-	-
P-5A	-	-	-	1	1	0				1	-	-				-	-	-	2	1	-
P-6	-	-	-	-	-	-				2	-	-				-	-	-	2	-	-
P-7	-	-	-	-	-	-				-	-	-				3	-	-	3	-	-
S-2	6	6	-	-	-	-				-	-	-				-	-	-	6	6	-
L.S.L.	7	4	1	-	-	-				-	-	-				-	-	-	7	4	1
Totals	23	19	2	1	1	-	-	-	-	75	8	1	-	-	-	52	-	-	151	28	3

Table B-5-20 (Continued)

Month and Station	Brook Trout			Rainbow Trout			Brown Trout			Mountain Sucker			Flannelmouth Sucker			Speckled Dace			Totals		
	C*	M*	R*	C*	M*	R*	C*	M*	R*	C*	M*	R*	C*	M*	R*	C*	M*	R*	C*	M*	R*
September 1975																					
P-0										36	-	-				24	-	-	60	-	-
P-1	3	3	-							55	-	-				8	-	-	66	3	-
P-2	7	7	-							3	-	-				1	-	-	11	7	-
P-3	3	2	1							22	-	-				11	-	-	36	2	1
P-5										9	-	-				1	-	-	10	-	-
P-5A	3	3	-							4	-	-				1	-	-	8	3	-
P-6										14	-	-							14	-	-
S-1	2	-	-																2	-	-
S-2	2	-	-													12	-	-	14	-	-
LSL	3	2	1																3	2	1
WR-2^3																					
Totals	23	17	2	-	-	-	-	-	-	143	-	-	-	-	-	108	-	-	274	17	2
November 1975																					
P-1	1	1	-							9	-	-							10	1	-
P-2	3	3	-							2	2	-							5	5	-
P-3	3	3	1							4	3	-							7	6	1
P-5										1	-	-				1	-	-	2	-	-
P-5A	1	1	-							1	-	-				1	-	-	3	1	-
S-1	1	1	-																1	1	-
S-2	4	4	-													4	-	-	8	4	-
W-2										18	-	-							18	-	-
W-3	2	2	-							2	-	-							4	2	-
Totals	15	15	1	-	-	-	-	-	-	37	5	-	-	-	-	6	-	-	58	20	1
January 1976																					
P-1										1	-	-							1	-	-
P-2	1	-	1							65	18	1				2	-	-	68	18	2
P-3	1	-	-							2	-	-				1	-	-	4	-	-
S-2	15	15	-							7	-	-				5	-	-	27	15	-
LSL	12	12	-							-	-	-				-	-	-	12	12	1
Totals	29	27	2	-	-	-	-	-	-	75	18	1	-	-	-	8	-	-	112	45	3

Table B-5-20 (Concluded)

Month and Station	Brook Trout			Rainbow Trout			Brown Trout			Mountain Sucker			Flannelmouth Sucker			Speckled Dace			Totals		
	C*	M*	R*	C*	M*	R*	C*	M*	R*	C*	M*	R*	C*	M*	R*	C*	M*	R*	C*	M*	R*
March 1976																					
P-1	1	1	-							18	-	-				2	-	-	21	1	-
P-2	1	1	-	1	1	-				8	-	-				1	-	-	11	2	-
P-3	3	3	-							6	-	-				1	-	-	10	3	-
P-5										2	-	-				2	-	-	4	-	-
P-5A	5	5	-	1	1	-	1	1	-	4	-	-				1	-	-	12	7	-
P-6	2	2	-							3	-	-							5	2	-
S-1	5	4	1																5	4	1
S-2	14	7	3																14	7	3
LSL	11	10	-																11	10	-
WR-1													2	1	-				2	1	-
WR-2																1	-	-	1	-	-
Totals	42	33	4	2	2	-	1	1	-	41	-	-	2	1	-	8	-	-	96	37	4
May 1976																					
P-1	2	2	-							8	-	-				1	-	-	11	2	-
P-2	3	2	1	2	2	-				5	-	-				5	-	-	15	4	1
P-3	5	3	1							38	-	-				14	-	-	57	3	1
P-5				1	1	-				7	-	-				5	-	-	13	1	-
P-5A	2	2	-	1	1	-				10	-	-				5	-	-	18	3	-
P-6										5	-	-				4	-	-	9	-	-
P-7																3	-	-	3	-	-
S-1	4	2	2																4	2	2
S-2	16	12	4																16	12	4
LSL	21	-	1																21	-	1
W-2										7	-	-							7	-	-
WR-1																1	-	-	1	-	-
WR-2																1	-	-	1	-	-
Totals	53	23	9	4	4	-	-	-	-	80	-	-	-	-	-	39	-	-	176	27	9
July 1976																					
P-1	-	-	-	-	-	-	-	-	-	14	-	-	-	-	-	2	-	-	16	-	-
P-2	4	-	-							4	-	-							8	-	-
P-3										6	-	-							6	-	-
P-5																					
P-5A	1	-	-							4	-	-							5	-	-
P-6																					
P-7																10	-	-	10	-	-
S-1	2	-	2																2	-	2
S-2	4	-	-																4	-	-
WR-1																					
Totals	11	-	2	-	-	-	-	-	-	28	-	-	-	-	-	12	-	-	51	-	2
GRAND TOTAL	479	221	28	10	9	0	2	2	0	880	253	5	9	8	0	324	45	0	1704	538	31

1. Marking with numbered tags began in May 1975
2. One mottled sculpin and four mountain whitefish were collected from the White River in March 1975.
3. Numerous mottled sculpin were collected from the White River in September 1975.

* C = Captured, M = Marked, R = Recaptured

Station Legend:

P1-7:	Piceance Creek
S1-2:	Stewart Creek
LSL:	Lower Stewart Lake
W1-3:	Willow Creek
WR1-2:	White River

Table B-5-21 FISH POPULATION ESTIMATES[1] FOR SELECTED PICEANCE CREEK STATIONS BASED ON SAMPLING IN JULY 1975

Replicate	Total Fish	Mountain Suckers	Brook Trout	Speckled Dace
Station P-1				
1	35	18	2	15
2	26	15	0	11
3	18	9	0	9
Totals	79	42	2	35
Computational Data[1]				
T		42	2	35
$\sum_{i=1}^{k}(i-1)y_i$		33	0	29
R		0.78	0	0.82
$\hat{p}$		0.28	1.0	0.25
$(1-\hat{q}^k)$		0.63	1.0	0.55
Population Estimate $(\hat{N})$	131	66	2	63
95% Confidence Interval	43.6-218.4	30.6-101.4	-	11-115

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[1] Zippin (1958)

Table B-5-22 FISH POPULATION ESTIMATES[1] FOR PICEANCE CREEK (STATION P-3) BASED ON SAMPLING IN JULY 1975

Replicate	Total Fish	Mountain Suckers	Brook Trout	Speckled Dace
Station P-3				
1	25	13	4	8
2	11	7	1	3
3	9	4	2	3
Totals	45	24	7	14
Computational Data[1]				
T		24	7	14
$\sum_{i=1}^{k} (i-1)y_i$		15	5	9
R		0.62	0.71	0.64
$\hat{P}$		0.45	0.36	0.43
$(1-\hat{q}^k)$		0.83	0.74	0.82
Population Estimate ($\hat{N}$)	55	29	9	17
95% Confidence Interval	29.6-92.3	17-53	3.4-14.5	9.2-24.8

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[1] Zippin (1958)

Table B-5-23 FISH POPULATION ESTIMATES[1] FOR PICEANCE CREEK (STATION P-3) BASED ON SAMPLING IN SEPTEMBER 1975

	Total Fish	Mountain Suckers	Brook Trout	Speckled Dace
Replicate:				
1	24	16	1	7
2	5	3	1	1
3	7	3	1	3
Totals	36	22	3	11
Computational Data[1]:				
T		22	3	11
$\sum_{i=1}^{k}(i-1)y_i$		9	3	7
R		0.409	1.0	0.636
$\hat{p}$		0.655	0	0.45
$(1-\hat{q}^k)$		0.95	0	0.825
Population Estimate ($\hat{N}$)	39	23	-	13
95% Confidence Interval	24.4-47.3	17.4-28.6	-	7.2-18.7

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[1] Zippin (1958)

Table B-5-24 FISH POPULATION ESTIMATES[1] FOR PICEANCE CREEK (STATION P-3) BASED ON SAMPLING IN MAY 1976

	Total Fish	Mountain Suckers	Brook Trout	Speckled Dace
Replicate:				
1	31	23	5	3
2	14	9	0	5
3	12	6	0	6
Totals	57	38	5	14
Computational Data[1]:				
T		38	5	14
$\sum_{i=1}^{k}(i-1)y_i$		21	0	17
R		0.55	0	1.2
$\hat{p}$		0.52	1.0	0
$(1-\hat{q}^k)$		0.88	1.0	0
Population Estimate $(\hat{N})$		43	5	-
95% Confidence Interval		33.3-52.6	-	-

---

[1] Zippin (1958)

Table B-5-25 POPULATION ESTIMATES[1] FOR BROOK TROUT IN TRACT C-b VICINITY USING MARK-RECAPTURE DATA

Month	Number Caught C_t	Recaptures R_t	Number Marked (Less removals)	Marked Fish at Large M_t	C_tM_t
May 1975	19	0	12	0	0
July	23	2	19	12	276
September	23	2	17	31	713
November	15	1	15	48	720
January 1976	29	2	27	63	1,827
March	42	5	32	90	3,780
May	53	9	22	122	6,466
Totals	204	21	144	366	13,782

$t = 7$

$$\hat{N} = 626.45$$

95% C.I. = 1031.84 - 449.75

Chapman's formula for a Peterson population estimate[1]

$$\hat{N} = \frac{\sum_{t=1}^{k} C_tM_t}{R + 1}$$

Confidence Interval*

$$\frac{1}{CI} = \frac{1}{\frac{1}{\hat{N}} \pm 2\sqrt{\text{var}\,\frac{1}{\hat{N}}}}$$

Variance*

$$V\left(\frac{1}{\hat{N}}\right) = \frac{1}{\left(\sum_{i=1}^{t} N_iM_i\right)^2} \sum_{i=1}^{t} N_i \left(\frac{M_i}{\hat{N}}\right)\left(1 - \frac{M_i}{\hat{N}}\right)$$

$N_i = C_t$ = Number caught on ith day

$M_i = M_t$ = Number marked at the start of the ith day

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[1] Ricker (1968b)

*Burnham (no date)

Table B-5-26

SORENSON'S INDEX OF SIMILARITY (K)* OF SPECIES OF FISH BETWEEN STATIONS ON THE PICEANCE CREEK, SEPTEMBER 1974 - JULY 1976

Sample Dates	P1/P2	P1/P3	P1/P5	P1/P5A	P1/P6	P1/P7	P2/P3	P2/P5	P2/P5A	P2/P6	P2/P7	P3/P5	P3/P5A	P3/P6	P3/P7	P5/P5A	P5/P6	P5/P7	P5A/P6	P5A/P7	P6/P7
September 1974	0.67	0.67	0.67	----	1.0	1.0	1.0	1.0	----	0.67	0.67	1.0	----	0.67	0.67	----	0.67	0.67	----	----	
November 1974	0.40	0.67	0.40	0.0	0.0	0.0	0.67	1.0	0.0	0.0	0.0	0.67	0.0	0.0	0.0	0.0	0.0	0.0	**	**	**
January 1975	0.0	**	**	**	**	**	0.0	0.0	0.0	0.0	0.0	**	**	**	**	**	**	**	**	**	**
March 1975	1.0	0.86	0.80	0.80	0.0	0.0	0.86	0.80	0.80	0.0	0.0	0.67	0.67	0.0	0.0	0.50	0.0	0.0	0.0	0.0	0.0
May 1975	1.0	0.0	1.0	0.50	0.67	0.0	1.0	0.0	0.50	0.0	0.0	0.0	0.50	0.0	0.0	0.50	0.67	0.0	0.80	0.0	0.0
July 1975	0.80	1.0	0.50	0.40	0.40	0.50	0.80	0.67	0.50	0.67	0.67	0.50	0.40	0.50	0.50	0.50	1.0	0.0	0.67	0.0	0.0
September 1975	1.0	1.0	0.80	1.0	0.40	0.0	1.0	0.80	1.0	0.50	0.0	0.80	1.0	0.50	0.0	0.80	0.67	0.0	0.50	0.0	0.0
November 1975	1.0	1.0	0.50	0.80	0.0	0.0	1.0	0.50	0.80	0.0	0.0	0.50	0.80	0.0	0.0	0.80	0.0	0.0	0.0	0.0	**
January 1976	0.50	0.50	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**	**	**	**	**	**
March 1976	0.86	1.0	0.80	0.75	0.80	0.0	0.86	0.67	0.89	0.67	0.0	0.80	0.75	0.80	0.0	0.57	0.50	0.0	0.57	0.0	0.0
May 1976	0.86	1.0	0.80	.86	0.80	0.50	0.86	0.86	1.0	0.67	0.40	0.67	0.86	0.80	0.50	0.86	0.80	0.40	0.67	0.40	0.67
July 1976	0.50	0.0	0.0	0.50	0.0	0.67	0.0	0.0	1.0	0.0	0.67	0.0	0.0	**	0.0	0.0	**	0.0	0.0	0.0	0.0
Two Year Period	0.75	0.75	0.57	0.89	0.86	0.57	1.0	0.86	0.89	0.89	0.67	0.86	0.89	0.86	0.57	0.75	0.67	0.67	0.75	0.50	0.67
Mean	0.72	0.70	0.57	0.56	0.37	0.24	0.75	0.53	0.59	0.27	0.20	0.51	0.50	0.33	0.15	0.50	0.48	0.10	0.40	0.05	0.10

* K indicates the relative degree of similarity between two samples with respect to a particular parameter. A value of 1.0 indicates the samples are identical while a zero value indicates no similarity. 0.650 is considered the break point below which the pairs are not considered similar and above which they are considered similar.

**No fish species found at either station.

Table B-5-27 SORENSON'S INDEX OF SIMILARITY (K)* OF SPECIES OF FISH BETWEEN STATIONS ON STEWART CREEK AND LAKES, SEPTEMBER 1974-JULY 1975

Sample Dates	S1/S2	S1/LSL	S2/LSL
September 1974	**	0.0	0.0
November 1974	**	0.0	0.0
January 1975	0.0	0.0	0.67
March 1975	0.0	0.0	0.67
May 1975	0.0	0.0	1.0
July 1975	1.0	1.0	1.0
September 1975	0.67	1.0	0.67
November 1975	0.67	0.0	0.0
January 1976	0.0	0.0	0.50
March 1976	1.0	1.0	1.0
May 1976	1.0	1.0	1.0
July 1976	1.0	0.0	0.0
Two Year Period	0.50	0.50	0.67
Mean	0.53	0.33	0.54

*K indicates the relative degree of similarity between two samples with respect to a particular parameter. A value of 1.0 indicates the samples are identical while a zero value indicates no similarity. 0.650 is considered the break point below which the pairs are not considered similar and above which they are considered similar.

**No fish species found at either station.

Table B-5-28 SORENSON'S INDEX OF SIMILARITY (K)* OF SPECIES OF FISH BETWEEN STATIONS ON WILLOW CREEK, SEPTEMBER 1974 - JULY 1976

Sample Dates	W2/W3
September 1974	0.0
November 1974	0.0
January 1975	0.0
March 1975	0.0
May 1975	0.0
July 1975	**
September 1975	**
November 1975	0.67
January 1976	**
March 1976	**
May 1976	0.0
July 1976	**
Two-Year Period	0.50
Mean	0.10

* K indicates the relative degree of similarity between two samples with respect to a particular parameter. A value of 1.0 indicates the samples are identical while a zero value indicates no similarity. 0.650 is considered the break point below which the pairs are not considered similar, and above which they are considered similar.

**No fish species found at either station.

Table B-5-29 SORENSON'S INDEX OF SIMILARITY (K)* OF SPECIES OF FISH BETWEEN STATIONS ON THE WHITE RIVER, SEPTEMBER 1974 - JULY 1976

Sample Dates	WR1 / WR2
September 1974	**
November 1974	0.0
January 1975	**
March 1975	0.50
May 1975	**
July 1975	**
September 1975	0.67
November 1975	**
January 1976	**
March 1976	0.0
May 1976	0.67
July 1976	0.0
Year	0.75
Mean	0.31

* K indicates the relative degree of similarity between two samples with respect to a particular parameter. A value of 1.0 indicates the samples are identical while a zero value indicates no similarity. 0.650 is considered the break point below which the pairs are not considered similar, and above which they are considered similar.

**No fish species found at either station.

Table B-5-30 FRIEDMAN'S NONPARAMETRIC ANALYSIS AND MULTIPLE COMPARISONS[1] OF FISH DISTRIBUTIONS ALONG AQUATIC SAMPLING STATIONS, SEPTEMBER 1974 - JULY 1976

	Friedman's Anova				Multiple Comparisons	
	α	Test Statistic	Critical Value	Decision on Null	α	Conclusions[2]
1. H_0: Fish are distributed evenly along Piceance Creek's Stations 1-7	0.05	25.94	11.07	Reject	0.20	P1=P2=P3≠P5=P6=P7
2. H_0: Fish are evenly distributed along Willow Creek Stations 1-3	0.05	7.0	5.99	Reject	0.20	W3≠W2=W1
3. H_0: Fish are evenly distributed along Stewart Creek Stations 1,2 and LSL	0.05	10.61	5.99	Reject	0.05	S2=LSL≠S1
4. H_0: Fish are evenly distributed along White River Stations 1 and 2	0.05	0.67	3.84	Accept		No test (WR1=WR2)

[1] ZAR (1974)

[2] Ranked in descending order

Table B-5-31 DATA COLLECTED FROM SPRINGS AND SEEPS ALONG PICEANCE CREEK

Spring No.	Date	Temperature	D.O.	Macroinvertebrates
1	Mar. 18-19, 1975	6°C	-	Diptera
				Tipulidae
				Tipula
				Trichoptera
				Hesperophylax
				Coleoptera
				Heterlimnius
				Basommatophora
				Physa
	July 10-11, 1975			Not sampled since higher water has inundated spring source. Lake was sampled by aquatic team in July.
2	Mar. 18-19, 1975	7°C		Diptera
				Tipulidae
				Tipula
				Plecoptera
				Isoperla
				Trichoptera
				Hesperophylax
				Basommatophora
				Physa *Lymnaea* sp. A
				Pelecypoda
				Pisidium

Table B-5-31 (Continued)

Spring No.	Date	Temperature	D.O.	Macroinvertebrates
2 (cont)	Mar. 18-19, 1975	7°C		Tricladida
				Polycelis
				Amphipoda
				Gammarus
	July 10-11, 1975	9°C	7.2 ppm	Diptera
				Stratiomyiidae
				Euparyphus
				Plecoptera
				Isoperla *Nemoura*
				Trichoptera
				Hesperophylax
				Basommatophora
				Physa *Lymnaea* sp. B (elongated spire)
				Tricladida
				Polycelis
				Coleoptera
				Hydrovatus
				Amphipoda
				Gammarus
3	Mar. 18-19, 1975	6°C	-	Diptera
				Tipulidae
				Tipula

Table B-5-31 (Continued)

Spring No.	Date	Temperature	D.O.	Macroinvertebrates
3 (cont)	Mar. 18-19, 1975	6°C	-	Basommatophora
				Physa
				Coleoptera
				Elmid larvae
				Trichoptera
				Hesperophylax
				Tricladida
				Polycelis
				Amphipoda
				Gammarus
				Hirudinea
				Helobdella
	July 10-11, 1975	7°C	6.2 ppm	Diptera
				Tipulidae
				Tipula
				Chironomidae
				Orthocladius *Phaenopsectra*
				Trichoptera
				Hesperophylax
				Tricladida
				Polycelis
				Hirudinea
				Helobdella

Table B-5-31 (Continued)

Spring No.	Date	Temperature	D.O.	Macroinvertebrates
3 (cont)	July 10-11, 1975	7°C	6.2 ppm	Amphipoda
				Gammarus
				Coleoptera
				Elmid larvae
				Basommatophora
				Physa
				Oligochaeta
				Naididae
4	Seep forming marsh at mouth of East Stewart Gulch. Rushes (Carex). Not sampled since no pool or stream channel present.			
5	Mar. 18-19, 1975	6.5°C		Trichoptera
				Hesperophylax
				Basommatophora
				Physa
				Amphipoda
				Gammarus
				Coleoptera
				Elmid larvae
				Tricladida
				Polycelis
	July 10-11, 1975	7°C	6.5 ppm	Trichoptera
				Hesperophylax
				Basommatophora
				Physa
				Amphipoda
				Gammarus

Table B-5-31 (Continued)

Spring No.	Date	Temperature	D.O.	Macroinvertebrates
5 (cont)	July 10-11, 1975	7°C	6.5 ppm	Coleoptera
				Hydrovatus
				Tricladida
				Polycelis
				Diptera
				Chironomidae
				Phaenopsectra
				Oligochaeta
				Naididae
6	Mar. 18-19, 1975	8°C	-	Diptera
				Tipulidae
				Tipula
				Chironomidae
				Psectrocladius
				Tribelos (?)
				Procladius
				Trichoptera
				Hesperophylax
				Plecoptera
				Isoperla
				Tricladida
				Polycelis
				Basommatophora
				Physa

Spring No.	Date	Temperature	D.O.	Macroinvertebrates
6 (cont)	Mar. 18-19, 1975	8°C	-	Coleoptera
				Elmid larvae *Heterlimnius* adults
				Oligochaeta
				Naididae
				Ephemeroptera
				Baetis
	July 10-11, 1975	8.5°C	3.3 ppm	Diptera
				Tipulidae
				Tipula
				Trichoptera
				Hesperophylax
				Basommatophora
				Physa
				Tricladida
				Polycelis
				Coleoptera
				Heterlimnius
7	Mar. 18-19, 1975	6.5°C	-	Hirudinea
				Helobdella
				Oligochaeta
				Naididae
				Trichoptera
				Hesperophylax

Table B-5-31 (Continued)

Spring No.	Date	Temperature	D.O.	Macroinvertebrates
7 (cont)	Mar. 18-19, 1975	6.5°C	-	Diptera
				Chironomidae
				Tribelos (?)
				Tricladida
				Polycelis
				Basommatophora
				Physa
				Pelecypoda
				Pisidium
				Coleoptera
				Hydrovatus
				Amphipoda
				Gammarus
	July 10-11, 1975	8°C	4.8 ppm	Trichoptera
				Hesperophylax
				Basommatophora
				Physa
				Amphipoda
				Gammarus
				Tricladida
				Polycelis
8	Mar. 18-19, 1975	7°C	-	Diptera
				Tipulidae
				Tipula
				Simuliidae larvae

Table B-5-31 (Continued)

Spring No.	Date	Temperature	D.O.	Macroinvertebrates
8 (cont)	Mar. 18-19, 1975	7^{0}C	-	Plecoptera
				Isoperla
				Trichoptera
				Hesperophylax
				Ephemeroptera
				Baetis
				Tricladida
				Polycelis
	July 10-11, 1975	8.5^{0}C	4.5 ppm	Tricladida
				Polycelis
				Plecoptera
				Isoperla
				Trichoptera
				Hesperophylax
9	Mar. 18-19, 1975	7^{0}C	-	Amphipoda
				Gammarus
				Coleoptera
				Agabus
				Odonata
				Ischnura
				Ephemeroptera
				Callibaetis
				Diptera
				Chironomidae
				Psectrotanypus
				Orthocladius
				Micropsectra

Table B-5-31 (Continued)

Spring No.	Date	Temperature	D.O.	Macroinvertebrates
9 (cont)	July 10-11, 1975	9°C	8.0 ppm	Diptera
				Chironomidae
				Tribelos (?)
				Amphipoda
				Gammarus
				Basommatophora
				Physa
				Pelecypoda
				Pisidium
				Hemiptera
				immature Notonectidae
				Ephemeroptera
				Callibaetis
10	Mar. 18-19, 1975	7°C	-	Diptera
				Tipulidae
				Tipula
				Chironomidae
				Prodiamesa
				Plecoptera
				Isoperla
				Trichoptera
				Hesperophylax
				Ephemeroptera
				Baetis
				Tricladida
				Polycelis

Table B-5-31 (Continued)

Spring No.	Date	Temperature	D.O.	Macroinvertebrates
10 (cont)	July 10-11, 1975	7.5°C	3.9 ppm	Diptera
				Tipulidae
				Tipula
				Plecoptera
				Nemoura *Isoperla*
				Tricladida
				Polycelis
				Trichoptera
				Hesperophylax *Agraylea*
11	Seep forming a *Carex* marsh southeast of Savage Cabin, Stewart Gulch. Not sampled since no well-defined channel or pool.			
12	Seep immediately to the southeast of Spring 11. Similar to Spring 11. Not sampled.			

Table B-5-32 DATA COLLECTED FROM SPRINGS AND SEEPS ALONG PICEANCE CREEK

Spring No.	Date	Temperature (^{o}C)	D.O. (ppm)	Macroinvertebrates
2	11/14/75	7.0	7.3	Diptera Tipulidae *Tipula* Basommatophora *Physa* Amphipoda *Gammarus*
3	11/14/75	7.0	6.0	Coleoptera *Heterlimnius* Trichoptera *Hesperophylax* Amphipoda *Gammarus* Basommatophora *Physa* Tricladida Polycelis
5	11/14/75	7.5	6.0	Diptera Chironomidae *Cricotopus* Coleoptera *Agabus*

Table B-5-32 (Concluded)

Spring No.	Date	Temperature (°C)	D.O. (ppm)	Macroinvertebrates
5(cont.)	11/14/75	7.5	6.0	Basommatophora
				Physa
				Amphipoda
				Gammarus
6	11/14/75	7.5	4.0	Diptera
				Empididae
				Hemerodromia
				Ephemeroptera
				Baetis
				Coleoptera
				Heterlimnius
				Trichoptera
				Hesperophylax
Spring ~2 miles upstream from mouth of Piceance Creek				
	11/14/75	-	-	Diptera
				Syrphidae
				Tubifera (Rat-tailed maggot)
				Ceratopogonidae
				Palpomyia
				Ephydridae
				Ephydra

Table B-5-33 DATA COLLECTED FROM SPRINGS AND SEEPS ALONG PICEANCE CREEK, MARCH 11-12, 1976

Spring No.	Temperature (^{o}C)	Macroinvertebrates
2	7.5	Amphipoda
		Gammarus
		Tricladida
		Polycelis
		Basommatophora
		Lymnaea
		Plecoptera
		Isoperla
		Trichoptera
		Hesperophylax
		Diptera
		Tipulidae
		Tipula
		Liriopeidae (=Ptychopteridae)
		Liriope (=Ptychoptera)
3	7.0	Amphipoda
		Gammarus
		Tricladida
		Polycelis
		Basommatophora
		Physa

Table B-5-33 (Continued)

Spring No.	Temperature (^{o}C)	Macroinvertebrates
3(cont.)	7.0	Oligochaeta
		Tubificidae
		Ephemeroptera
		Baetis
		Trichoptera
		Hesperophylax
		Coleoptera
		Elmidae
		Heterlimnius
		Dytiscidae
		Agabus
		Diptera
		Tipulidae
		Tipula
5	7.0	Amphipoda
		Gammarus
		Hirudinea
		Helobdella
		Tricladia
		Polycelis
		Basommatophora
		Physa

Table B-5-33 (Continued)

Spring No.	Temperature (^{o}C)	Macroinvertebrates
5(Cont.)	7.0	Oligochaeta
		Tubificidae
		Trichoptera
		Hesperophylax
		Agraylea
		Coleoptera
		Heterlimnius
		Diptera
		Tipulidae
		Tipula
6	8.5	Tricladida
		Polycelis
		Ephemeroptera
		Baetis
		Plecoptera
		Isoperla
		Coleoptera
		Heterlimnius
		Diptera
		Chironomidae
		Parachironomus

Table B-5-33 (Continued)

Spring No.	Temperature (^{O}C)	Macroinvertebrates
7	7.0	Amphipoda
		Gammarus
		Tricladida
		Polycelis
		Basommatophora
		Physa
		Pelecypoda
		Pisidium
		Trichoptera
		Hesperophylax
		Diptera
		Tipulidae
		Tipula
		Chironomidae
		Parachironomus
8	6.0	Tricladia
		Polycelis
		Basommatophora
		Physa
		Oligochaeta
		Tubificidae

Table B-5-33 (Concluded)

Spring No.	Temperature (^{o}C)	Macroinvertebrates
8(cont.)	6.0	Coleoptera
		Hydrovatus
		Agabus
		Diptera
		Tipulidae
		Tipula
		Dicranota
10	7.5	Tricladia
		Polycelis
		Oligochaeta
		Tubificidae
		Trichoptera
		Hesperophylax
		Coleoptera
		Agabus
		Ephemeroptera
		Baetis
		Diptera
		Tipulidae
		Tipula
		Dicranota
		Dixidae
		Dixa

Table B-5-34 DATA COLLECTED FROM SPRINGS AND SEEPS ALONG PICEANCE CREEK

Spring No.	Date	Temperature (^{o}C)	Macroinvertebrates
2	7/27 & 28/76	8.5	Amphipoda
			Gammarus
			Tricladida
			Polycelis
			Plecoptera
			Isoperla *Nemoura*
			Trichoptera
			Hesperophylax
			Diptera
			Tipulidae
			Tipula
			Dixidae
			Dixa
			Stratiomyiidae
			Euparyphus
3	7/27 & 28/76	7.0	Coleoptera
			Elmidae larvae
			Heterlimnius
			Ephemeroptera
			Baetis

Table B-5-34 (Continued)

Spring No.	Date	Temperature (^{o}C)	Macroinvertebrates
3(cont.)	7/27 & 28/76	7.0	Tricladida
			Polycelis
			Oligochaeta
			Microdrili
			Trichoptera
			Hesperophylax
			Basommatophora
			Physa
			Diptera
			Chironomidae
			Diamesa
			Orthocladius
5	7/27 & 28/76	7.0	Ephemeroptera
			Callibaetis
			Amphipoda
			Gammarus
			Hirudinea
			Helobdella
			Basommatophora
			Physa
			Coleoptera
			Elmidae larvae

Table B-5-34 (Continued)

Spring No.	Date	Temperature (^{o}C)	Macroinvertebrates
5(cont.)	7/27 & 28/76	7.0	Trichoptera
			Hesperophylax
			Diptera
			Tipulidae
			Tipula
6	7/27 & 28/76	8.0	Hirudinea
			Helobdella
			Diptera
			Tipulidae
			Tipula
			Oligochaeta
			Microdrili
			Tricladida
			Polycelis
			Coleoptera
			Elmidae larvae
			Heterlimnius
			Trichoptera
			Hesperophylax
			Ephemeroptera
			Baetis
			Amphipoda
			Gammarus

Table B-5-34 (Continued)

Spring No.	Date	Temperature ($^{\circ}C$)	Macroinvertebrates
7	7/27 & 28/76	8.0	Diptera Tipulidae *Tipula* Trichoptera *Hesperophylax* Tricladida *Polycelis* Pelecypoda *Pisidium*
7a	7/27 & 28/76	9.0	Limnocrene (man-made?) not previously sampled. Approximately 50 m south of S7. Approximately 1 m deep. Bottom covered with Charales. Watercress along edges in some spots. Ephemeroptera *Callibaetis* Diptera Tipulidae *Tipula* Chironomidae *Tribelos* *Cricotopus* Hirudinea *Helobdella*

Table B-5-34 (Continued)

Spring No.	Date	Temperature (^oC)	Macroinvertebrates
7a(cont.)	7/27 & 28/76	9.0	Pelecypoda
			Pisidium
			Oligochaeta
			Microdrili
8	7/27 & 28/76	8.0	Again flowing from initial source and with greater volume (see November 1975 comments)
			Diptera
			Chironomidae
			Orthocladius
			Tipulidae
			Tipula
			Plecoptera
			Isoperla
			Tricladia
			Polycelis
10	7/27 & 28/76	7.5	Tricladia
			Polycelis
			Diptera
			Dixidae
			Dixa

Table B-5-34 (Concluded)

Spring No.	Date	Temperature (^oC)	Macroinvertebrates
10(cont.)	7/27 & 28/76	7.5	Tipulidae
			Tipula
			Oligochaeta
			Microdrili
			Plecoptera
			Isoperla *Nemoura*
			Trichoptera
			Hesperophylax

Table B-5-35

WATER QUALITY ANALYSIS METHOD

Minerals	Method	Reference
Cations		
Calcium	EDTA Titrimetric Method	APHA*
Magnesium	EDTA Titrimetric Method	APHA
Sodium	Flame Photometric Method	APHA
Potassium	Flame Photometric Method	APHA
Ammonia	Nesslerization Method	APHA
Annions		
Hydroxide (OH)	Alkalinity	APHA
Carbonate	Alkalinity	APHA
Bicarbonate	Alkalinity	APHA
Sulfate	Gravimetric Method with drying of residue	APHA
Chloride	Mercuric Nitrate Method	APHA
Nitrate	Brucine Method (tentative)	APHA
Organics		
Ortho Phosphate	Stannous Chloride Method	APHA
Ammonia (N)	Nesslerization Method	APHA
Inorganics		
Boron	Carmine Method	APHA
Silica	Molybdosilicate Method	APHA
Iron	Phenanthroline Method	APHA
Manganese	Persulfate Method	APHA
Nitrate (N)	Brucine Method (tentative)	APHA
Nitrite (N)	Nitrogen (Nitrite)	APHA
Alkalinity ($CaCO_3$)	Alkalinity	APHA
Hardness ($CaCO_3$)	EDTA Titrimetric Method	APHA
Dissolved Solids	Filtrable Residue @ 180°C	APHA
pH	pH Value	APHA
Conductivity	Specific Conductance	APHA
Microbiology		
Standard Plate Count	Standard Plate Count @ 35°C	APHA
Coliform	Standard Total Coliform MPN Test	APHA

Table B-5-35 (continued)

Minerals	Method	Reference
Microbiology (continued)		
Fecal Coliform	Fecal Coliform MPN Procedure	APHA
Fecal Streptococci	Multiple-Tube Technique	APHA
Pathogens	Isolation of Enteric Bacteria (MacConkey's Agar)	Microbiology Zinsser (13th Ed.)
Sediments		
% Moisture	Total Residue on Evaporation	APHA
TKN	Nitrogen (Total Kjeldahl)	APHA
COD	Oxygen Demand (Chemical)	APHA
Volatile Solids	Total Volatile and Fixed Residue	APHA

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* APHA *Standard Methods*, 1975

Form 1279—3
(June 1984)

BORROWER'S CARD

[illegible]
Oil shale tract C-b [illegible]

DATE LOANED	BORROWER	OFFICE

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